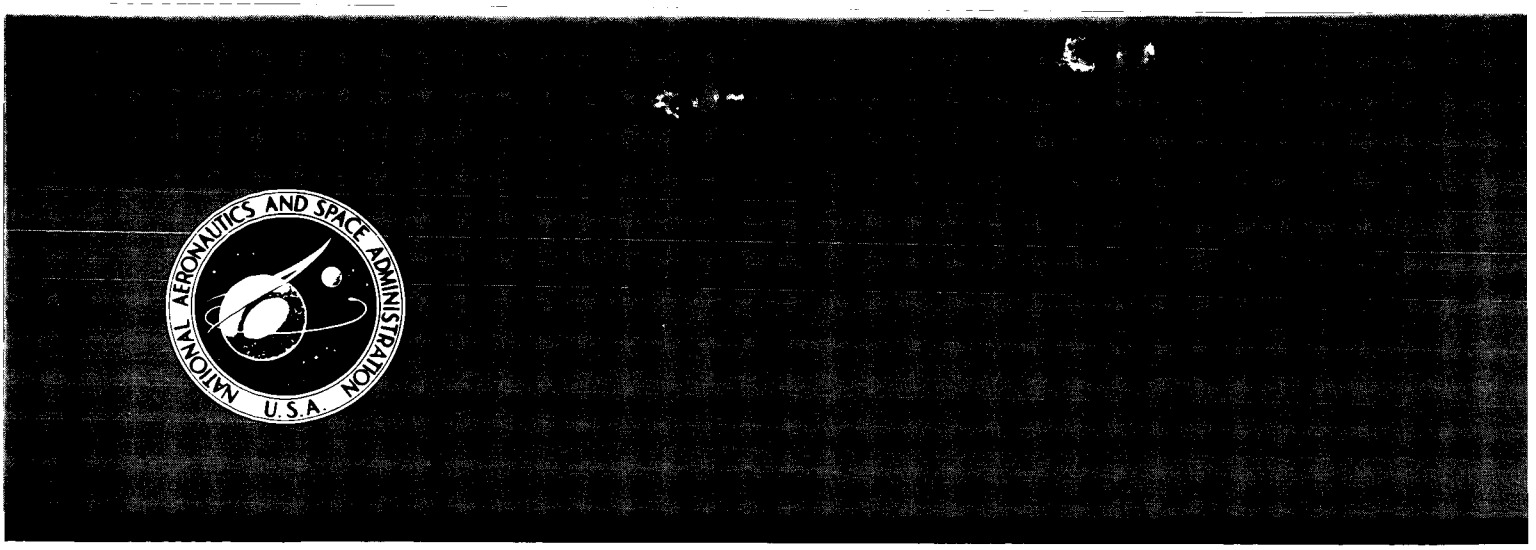

NASA PATENT ABSTRACTS BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

JANUARY 1987

(NASA-SP-7039(30)-Sect-1) NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 30) (National Aeronautics and Space Administration) 50 p CSCL 05B 00/82

N87-16654

Unclas 43479

ACCESSION NUMBER RANGES

Bibliography Number	*STAR Accession Numbers*
NASA SP-7039(04) SEC 1	N69-20701 – N73-33931
NASA SP-7039(12) SEC 1	N74-10001 – N77-34042
NASA SP-7039(13) SEC 1	N78-10001 – N78-22018
NASA SP-7039(14) SEC 1	N78-22019 – N78-34034
NASA SP-7039(15) SEC 1	N79-10001 – N79-21993
NASA SP-7039(16) SEC 1	N79-21994 – N79-34158
NASA SP-7039(17) SEC 1	N80-10001 – N80-22254
NASA SP-7039(18) SEC 1	N80-22255 – N80-34339
NASA SP-7039(19) SEC 1	N81-10001 – N81-21997
NASA SP-7039(20) SEC 1	N81-21998 – N81-34139
NASA SP-7039(21) SEC 1	N82-10001 – N82-22140
NASA SP-7039(22) SEC 1	N82-22141 – N82-34341
NASA SP-7039(23) SEC 1	N83-10001 – N83-23266
NASA SP-7039(24) SEC 1	N83-23267 – N83-37053
NASA SP-7039(25) SEC 1	N84-10001 – N84-22526
NASA SP-7039(26) SEC 1	N84-22527 – N84-35284
NASA SP-7039(27) SEC 1	N85-10001 – N85-22341
NASA SP-7039(28) SEC 1	N85-22342 – N85-36162
NASA SP-7039(29) SEC 1	N86-10001 – N86-22536
NASA SP-7039(30) SEC 1	N86-22537 – N86-33262

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NASA SP-7039(30)
Section 1
Abstracts

NASA

PATENT ABSTRACTS BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

Annotated references to NASA-owned inventions covered by U.S. patents and applications for patent that were announced in *Scientific and Technical Aerospace Reports (STAR)* between July 1986 and December 1986.

Scientific and Technical Information Branch 1987
National Aeronautics and Space Administration
Washington, DC

This supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, price code A03.

INTRODUCTION

Several thousand inventions result each year from the aeronautical and space research supported by the National Aeronautics and Space Administration. The inventions having important use in government programs or significant commercial potential are usually patented by NASA. These inventions cover practically all fields of technology and include many that have useful and valuable commercial application.

NASA inventions best serve the interests of the United States when their benefits are available to the public. In many instances, the granting of nonexclusive or exclusive licenses for the practice of these inventions may assist in the accomplishment of this objective. This bibliography is published as a service to companies, firms, and individuals seeking new, licensable products for the commercial market.

The *NASA Patent Abstracts Bibliography (NASA PAB)* is a semiannual NASA publication containing comprehensive abstracts and indexes of NASA-owned inventions covered by U.S. patents and applications for patent. The citations included in *NASA PAB* were originally published in NASA's *Scientific and Technical Aerospace Reports (STAR)* and cover *STAR* announcements made since May 1969.

For the convenience of the user, each issue of *NASA PAB* has a separately bound Abstract Section (Section 1) and Index Section (Section 2). Although each Abstract Section covers only the indicated six-month period, the Index Section is cumulative covering all NASA-owned inventions announced in *STAR* since 1969. Thus a complete set of *NASA PAB* would consist of the Abstract Sections of Issue 04 (January 1974) and Issue 12 (January 1978) and the Abstract Section for all subsequent issues and the Index Section for the most recent issue.

The 105 citations published in this issue of the Abstract Section cover the period July 1986 through December 1986. The Index Section references over 4500 citations covering the period May 1969 through December 1986.

ABSTRACT SECTION (SECTION 1)

This *PAB* issue incorporates the 1975 *STAR* category revisions which include 10 major subdivisions divided into 74 specific categories and one general category/division. (See Table of Contents for the scope note of each category under which are grouped appropriate NASA inventions.) This new scheme was devised in lieu of the 34 category divisions which were utilized in *PAB* supplements (01) through (06) covering *STAR* abstracts from May 1969 through January 1974. Each entry in the Abstract Section consists of a *STAR* citation accompanied by an abstract and a key illustration taken from the patent or application for patent drawing. Entries are arranged in subject category in order of the ascending NASA Accession Number originally assigned in *STAR* to the invention. The range of NASA Accession Numbers within each issue is printed on the inside front cover.

Abstract Citation Data Elements: Each of the abstract citations has several data elements useful for identification and indexing purposes, as follows:

NASA Accession Number
NASA Case Number
Inventor's Name
Title of Invention
U.S. Patent Application Serial Number
U.S. Patent Number (for issued patents only)
U.S. Patent Office Classification Number(s)
(for issued patents only)

These data elements are identified in the Typical Citation and Abstract and in the indexes.

INDEX SECTION (SECTION 2)

The Index Section is divided into five indexes. These indexes are cross-indexed and are used to locate a single invention or groups of inventions.

Subject Index: Lists all inventions according to appropriate alphabetized technical term and indicates the related NASA Case Number, the Subject Category Number, and the Accession Number.

Inventor Index: Lists all inventions according to alphabetized names of inventors and indicates the related NASA Case Number, the Subject Category Number, and the Accession Number.

Source Index: Lists all inventions according to alphabetized source of invention (i.e., name of contractor or government installation where invention was made) and indicates the related NASA Case Number, the Subject Category Number, and the Accession Number.

Number Index: Lists inventions in order of ascending (1) NASA Case Number, (2) U.S. Patent Application Serial Number, (3) U.S. Patent Classification Number, and (4) U.S. Patent Number and indicates the related Subject Category Number and the Accession Number.

Accession Number Index: Lists all inventions in order of ascending Accession Number and indicates the related Subject Category Number, the NASA Case Number, the U.S. Patent Application Serial Number, the U.S. Patent Classification Number, and the U.S. Patent Number.

HOW TO USE THIS PUBLICATION TO IDENTIFY NASA INVENTIONS

To identify one or more NASA inventions within a specific technical field or subject, several techniques are possible with the flexibility incorporated into the *NASA PAB.*

(1) *Using Subject Category:* To identify all NASA inventions in any one of the subject categories in this issue of *NASA PAB,* select the desired Subject Category in the Abstract Section (Section 1) and find the inventions abstracted thereunder.

(2) *Using Subject Index:* To identify all NASA inventions listed under a desired technical subject index term, (A) turn to the cumulative Subject Index in the Index Section and find the invention(s) listed under the desired technical subject term. (B) Note the indicated Accession Number and the Subject Category Number. (C) Using the indicated Accession Number, turn to the inside front cover of the Index Section to determine which issue of the Abstract Section includes the Accession Number desired. (D) To find the abstract of the particular invention in the issue of the Abstract Section selected, (i) use the Subject Category Number to locate the Subject Category and (ii) use the Accession Number to locate the desired invention within the Subject Category listing.

(3) *Using Patent Classification Index:* To identify all inventions covered by issued NASA patents (does not include applications for patent) within a desired Patent Classification, (A) turn to the Patent Classification Number in the Number Index of Section 2 and find the associated invention(s), and (B) follow the instructions outlined in (2)(B), and (D) above.

TYPICAL CITATION AND ABSTRACT

ON MICROFICHE

NASA SPONSORED

ACCESSION NUMBER → **N86-20470*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. ← CORPORATE SOURCE

TITLE → **TELESCOPING SPACE STATION MODULES Patent Application**

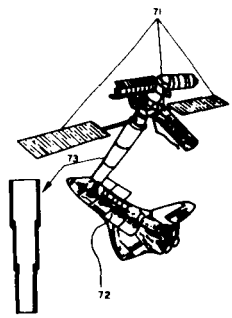
INVENTORS → R. D. WITCOFSKI, inventor (to NASA) 31 Jul. 1985 15 p

NASA CASE NUMBER → (NASA-CASE-LAR-13330-1; NAS 1.71:LAR-13330-1;

US PATENT APPLICATIONS SERIAL NUMBER → US-PATENT-APPL-SN-761233) Avail: NTIS HC A02/MF A01 ← PRICE CODE

COSATI CODE → CSCL 22B ← AVAILABILITY SOURCE

A space station module consisting of a cylindrical can within a can is presented. The outer can, which has one open end, encloses the inner can. The inner can has one tapered end with a hatch and one untapered end with a hatch. The outer can has one tapered end with a hatch. The overall length of the outer can is 25 ft, and its outer diameter is 14 ft. Two such assemblies easily fit end to end in the Shuttle Orbiter payload bay. With a shuttle payload capability of 65,000 pounds and an approximate weight of each twin can assembly of 16,000 pounds, 33,000 pounds of payload are available for instrumenting the cans. Only the inner can can be instrumented prior to launch. Once in orbit, the module is expanded to provide twice the usable space, approximately 48 ft total length. NASA ← ABSTRACT



KEY ILLUSTRATION

TABLE OF CONTENTS

Section 1 • Abstracts

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics.*

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences.*

LIFE SCIENCES

Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) **N.A.**
Includes genetics.

52 AEROSPACE MEDICINE **N.A.**
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES **N.A.**
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT **27**
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY **N.A.**
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) **N.A.**

60 COMPUTER OPERATIONS AND HARDWARE **28**
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE **N.A.**
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS
Includes computer networks.

63 CYBERNETICS **N.A.**
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS **N.A.**
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY **N.A.**
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS **N.A.**
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS **N.A.**
Includes topology and number theory.

PHYSICS **N.A.**

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering.*

70 PHYSICS (GENERAL) **N.A.**
For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar Physics.*

71 ACOUSTICS **N.A.**
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS **29**
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS **N.A.**
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS **30**
Includes light phenomena.

75 PLASMA PHYSICS **N.A.**
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS **32**
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS **N.A.**
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) **N.A.**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **N.A.**
Includes management planning and research.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

GENERAL

Note: N.A. means that no abstracts were assigned to this category for this issue.

Section 2 • Indexes

JANUARY 1987 (Supplement 30)

NASA Patent Abstracts Bibliography

A Semiannual Publication of the National Aeronautics and Space Administration

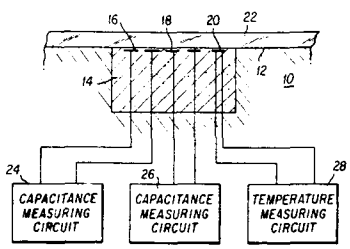
03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

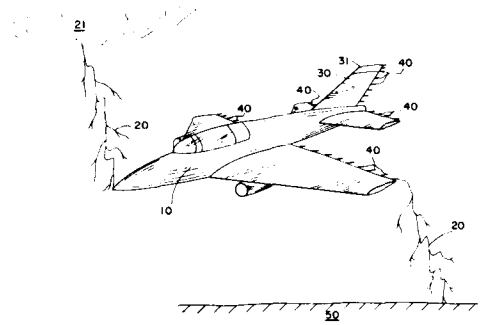
N86-24673*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ICE DETECTOR Patent Application
L. M. WEINSTEIN, inventor (to NASA) 31 Mar. 1986 14 p
(NASA-CASE-LAR-13403-1; NAS 1.71:LAR-13403-1;
US-PATENT-APPL-SN-846429) Avail: NTIS HC A02/MF A01
CSCL 01C

An ice detector for aircraft that can accurately determine the presence and thickness of ice and control devices to remove it is proposed. A small depression on the surface of an aircraft structure is filled with a plastic or epoxy material. Two capacitance gauges and a temperature gauge are embedded in this material near the surface. When moisture forms on the surface the capacitance of each of the gauges changes. This signal combined with the signal from a temperature gauge determines whether the moisture is water or ice. If ice is present its thickness may be measured based on the output of the second capacitance gauge. Once the presence of ice is determined, the thickness is easily determined. The output of the device may be used to provide an indication to the pilot or to automatically control heating elements to remove the ice. NASA



N86-26296*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIGHTNING DISCHARGE PROTECTION ROD Patent Application
C. F. BRYAN, JR., inventor (to NASA) 24 Apr. 1986 14 p
Sponsored by NASA
(NASA-CASE-LAR-13470-1; NAS 1.71:LAR-13470-1;
US-PATENT-APPL-SN-855983) Avail: NTIS HC A02/MF A01
CSCL 01C

This invention is a system for protecting an in-air vehicle from damage due to the craft sustaining a lightning strike. It is an extremely simple device consisting of a sacrificial graphite composite rod, approximately the diameter of a pencil with a length of about five inches. The sacrificial rod is constructed with the graphite fibers running axially within the rod in a manner that best provides a path of conduction axially from the trailing edge of an aircraft to the trailing end of the rod. The sacrificial rod is inserted into an attachment hole 32 machined into trailing edges of aircraft flight surfaces, such as vertical fin cap 31, and attached with adhesive in a manner not prohibiting the conduction path between the rod and aircraft. The trailing end of rod may be tapered for aerodynamic and esthetic requirements. This rod is sacrificial but has the capability to sustain several lightning strikes and still provide protection. The novelty of this invention appears to reside in a system for protecting the most vulnerable parts of an in-air vehicle when the craft is hit by lightning with an extremely simple and inexpensive device. The materials are easily procured and the sacrificial rod generally can be constructed from the same composite as the flight or control surface to be protected. The protection extends to several in-air lightning strikes and provides protection to aircraft parts manufactured from all materials including organic composites. NASA



04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

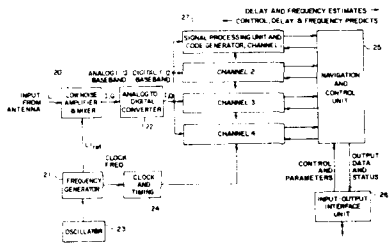
Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

N86-27270* National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH DYNAMIC GLOBAL POSITIONING SYSTEM RECEIVER Patent
W. J. HURD, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena) 25 Mar. 1986 13 p Filed 14 Nov. 1983 Supersedes N84-12151 (22 - 03, p 330) Sponsored by NASA. Pasadena Office
(NASA-CASE-NPO-16171-1CU; US-PATENT-4,578,678;
US-PATENT-APPL-SN-551536; US-PATENT-CLASS-343-357;
US-PATENT-CLASS-343-418) Avail: US Patent and Trademark Office CSCL 17G

A Global Positioning System (GPS) receiver having a number of channels, receives an aggregate of pseudorange code time division modulated signals. The aggregate is converted to baseband and then to digital form for separate processing in the separate channels. A fast fourier transform processor computes the signal energy as a function of Doppler frequency for each correlation lag, and a range and frequency estimator computes estimates of pseudorange, and frequency. Raw estimates from all channels are used to estimate receiver position, velocity, clock offset and

clock rate offset in a conventional navigation and control unit, and based on the unit that computes smoothed estimates for the next measurement interval.

Official Gazette of the U.S. Patent and Trademark Office



06

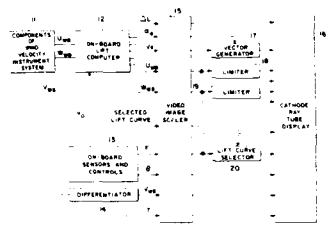
AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

N86-27280* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRCRAFT LIFTMETER Patent
E. W. MILLEN, inventor (to NASA) 29 Apr. 1986 10 p Filed 8 Feb. 1984 Supersedes N84-32383 (22 - 22, p 3535) Sponsored by NASA. Langley Research Center
(NASA-CASE-LAR-12518-1; US-PATENT-4,586,140; US-PATENT-APPL-SN-578388; US-PATENT-CLASS-364-433; US-PATENT-CLASS-364-435; US-PATENT-CLASS-244-181; US-PATENT-CLASS-73-178T; US-PATENT-CLASS-340-968)
Avail: US Patent and Trademark Office CSCL 01D

A display for aiding the pilot of an aircraft in anomalous wind environments is described. Wind velocity components are measured by an instrument, processed by a computer and a vector generator, and then displayed as a vector. The display utilizes the measurements of ground speed and of wind velocity in three mutually perpendicular directions. This display will also show changes in lift of an aircraft.

Official Gazette of the U.S. Patent and Trademark Office



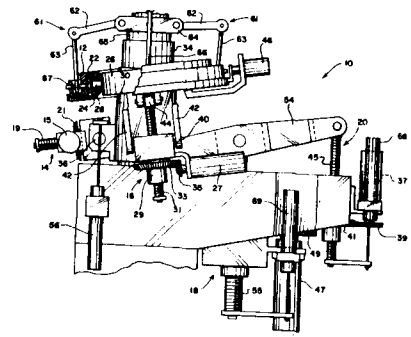
08

AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N86-24700*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SWASHPLATE CONTROL SYSTEM Patent Application
R. J. PEYRAN, inventor (to NASA) (Army Aviation Engineering Flight Activity, Edwards AFB, Calif.), G. H. LAUB, inventor (to NASA) (Army Aviation Engineering Flight Activity, Edwards AFB, Calif.), and H. A. MORSE, inventor (to NASA) (Army Aviation Engineering Flight Activity, Edwards AFB, Calif.) 31 Mar. 1986 13 p
(NASA-CASE-ARC-11633-1; NAS 1.71:ARC-11633-1; US-PATENT-APPL-SN-846439) Avail: NTIS HC A02/MF A01 CSCL 01C

A mechanical system to control the position of a rotating swashplate is developed. This system provides independent lateral cyclic, longitudinal cyclic and collective pitch control of a helicopter rotor attached to the swashplate, without use of a mixer box. The system also provides direct, linear readout of cyclic and collective swashplate positions. A swashplate control system has a first gimbal ring pivotally mounted along a longitudinal axis. A second gimbal ring is pivotally attached to the first gimbal ring along a lateral axis. A longitudinal cyclic actuator pivots the first gimbal ring along the longitudinal axis. A lateral cyclic actuator pivots the second gimbal ring along the lateral axis. The lateral cyclic actuator is mounted on the first gimbal ring. A swashplate is rotatably mounted on the second gimbal ring. Prior swashplate control systems required use of a mixer box to provide true decoupling of lateral and longitudinal cyclic input to the swashplate. NASA



N86-27288* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THUMB-ACTUATED TWO-AXIS CONTROLLER Patent
R. H. HOLLOW, inventor (to NASA) (Computer Sciences Corp., Mountain View, Calif.) 22 Apr. 1986 11 p Filed 8 Sep. 1982 Supersedes N83-12098 (21 - 03, p 328) Sponsored by NASA. Ames Research Center
(NASA-CASE-ARC-11372-1; US-PATENT-4,584,510; US-PATENT-APPL-SN-415878; US-PATENT-CLASS-318-584; US-PATENT-CLASS-318-640; US-PATENT-CLASS-250-211K; US-PATENT-CLASS-200-157; US-PATENT-CLASS-244-234)
Avail: US Patent and Trademark Office CSCL 01C

A two axis joystick controller is described. It produces at least one output signal in relation to pivotal displacement of a member with respect to an intersection of the two axes. The member is pivotally movable on a support with respect to the two axes. The

support has a centrally disposed aperture. A light source is mounted on the pivotally movable member above the aperture to direct light through the aperture. A light sensor is mounted below the aperture in the support at the intersection of the two axes to receive the light from the light source directed through the aperture. The light sensor produces at least one output signal related to a location on the sensor at which the light from the light source strikes the sensor.

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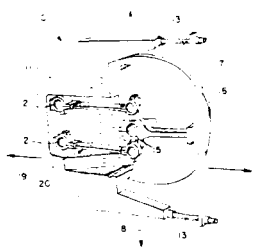
09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

N86-31594*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRFOIL FLUTTER MODEL SUSPENSION SYSTEM Patent Application
W. H. REED, III, inventor (to NASA) (DEI-Tech, Inc., Newport News, Va.) 30 Jul. 1986 14 p
(Contract NAS1-17686)
(NASA-CASE-LAR-13522-1; US-PATENT-APPL-SN-890575; NAS 1.71:LAR-13522-1) Avail: NTIS HC A02/MF A01 CSCL 14B

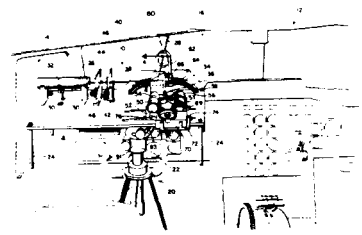
The invention is a wind tunnel suspension system for testing flutter models under various loads and at various angles of attack. The invention comprises a mounting bracket assembly affixing the suspension system to the wind tunnel, a drag-link assembly and a compound spring arrangement. The compound spring arrangement comprises a plunge spring working in opposition to a compressive spring so as to provide a high stiffness to trim out steady state loads and simultaneously a low stiffness to dynamic loads. By this arrangement an airfoil may be tested for oscillatory response in both plunge and pitch modes while being held under high lifting loads in a wind tunnel. NASA



N86-32447* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMULATOR SCENE DISPLAY EVALUATION DEVICE Patent
R. F. HAINES, inventor (to NASA) 12 Aug. 1986 8 p Filed 22 Dec. 1983 Supersedes N84-16221 (22 - 07, p 960
(NASA-CASE-ARC-11504-1; US-PATENT-4,605,303; US-PATENT-APPL-SN-565481; US-PATENT-CLASS-356-73)
Avail: US Patent and Trademark Office CSCL 14B

An apparatus for aligning and calibrating scene displays in an aircraft simulator has a base on which all of the instruments for the aligning and calibrating are mounted. Laser directs beam at double right prism which is attached to pivoting support on base. The pivot point of the prism is located at the design eye point (DEP) of simulator during the aligning and calibrating. The objective lens in the base is movable on a track to follow the laser beam at different angles within the field of vision at the DEP. An eyepiece and a precision diopter are movable into a position behind the prism during the scene evaluation. A photometer or illuminometer is pivotable about the pivot into and out of position behind the eyepiece.

Official Gazette of the U.S. Patent and Trademark Office



16

SPACE TRANSPORTATION

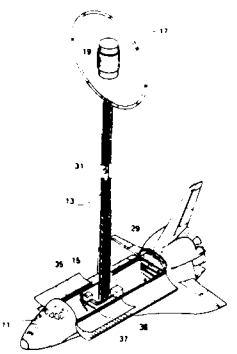
Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

N86-26352* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MAGNETIC SPIN REDUCTION SYSTEM FOR FREE SPINNING OBJECTS Patent
G. F. VONTIESENHAUSEN, inventor (to NASA) 15 Apr. 1986 6 p Supersedes N85-11122 Filed 23 Aug. 1984 Sponsored by NASA
(NASA-CASE-MFS-25966-1; US-PATENT-4,582,277; US-PATENT-APPL-SN-643522; US-PATENT-CLASS-244-161)
Avail: US Patent and Trademark Office CSCL 22B

A spinning Earth satellite is shown in which it is desired to reduce the rotation or spin to a level that the satellite may be secured or handled remotely from a spacecraft. This is accomplished by the spacecraft having a mast carrying an electrical current coil which encircles the satellite. The magnetic field of the coil is normal to the spin axis of the satellite which causes circular eddy current flow in the housing of the satellite. This generates magnetic force opposing the rotation. In another embodiment the

magnetic field is generated by the use of an electromagnet on a remote manipulation arm.

Official Gazette of the U.S. Patent and Trademark Office



18

SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

N86-24729* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

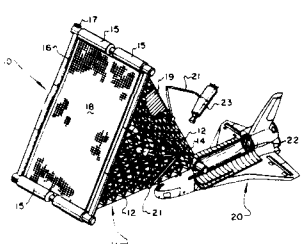
SHUTTLE-LAUNCH TRIANGULAR SPACE STATION Patent

W. C. SCHNEIDER, inventor (to NASA), R. B. BERKA, inventor (to NASA), C. KAVANAUGH, inventor (to NASA), K. NAGY, inventor (to NASA), R. C. PARISH, inventor (to NASA), J. A. SCHLIESING, inventor (to NASA), P. D. SMITH, inventor (to NASA), F. J. STEBBINS, inventor (to NASA), and C. J. WESSELSKI, inventor (to NASA) 1 Apr. 1986 9 p Filed 9 Mar. 1984 Sponsored by NASA

(NASA-CASE-MSC-20676-1; US-PATENT-4,579,302; US-PATENT-APPL-SN-587764; US-PATENT-CLASS-244-159) Avail: US Patent and Trademark Office CSCL 22B

A triangular space station deployable in orbit is described. The framework is comprized of three trusses, formed of a pair of generally planar faces consistine of foldable struts. The struts expand and lock into rigid structural engagement forming a repetition of equilater triangles and nonfolding diagonal struts interconnecting the two faces. The struts are joined together by node fittings. The framework can be packaged into a size and configuration transportable by a space shuttle. When deployed, the framework provides a large work/construction area and ample planar surface area for solar panels and thermal radiators. A plurity of modules are secured to the framework and then joined by tunnels to make an interconnected modular display. Thruster units for the space station orientation and altitude maintenance are provided.

Official Gazette of the U.S. Patent and Trademark Office



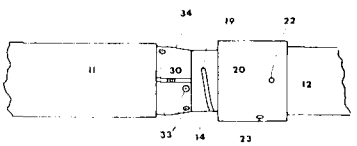
N86-31630*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PRELOADED SPACE STRUCTURAL COUPLING JOINTS Patent Application

M. D. RHODES, inventor (to NASA) 30 Jul. 1986 16 p

(NASA-CASE-LAR-13489-1; US-PATENT-APPL-SN-890445; NAS 1.71:LAR-13489-1) Avail: NTIS HC A02/MF A01 CSCL 22B

This invention relates to a coupling device for tubular members, of large truss structures, with a locking collar being the only moving part. Each tubular member is constructed with an end bell section that has a belled flange with a mating face, and a necked area which is smaller in diameter than the tubular members to be joined. A split ring is affixed to each tubular member and is constructed so that when two tubular members are laterally moved into axial alignment and the collar is rotated thereover, the split ring loads the joint with axial force by pressing the belled flange mating surfaces together, and a preloading force is provided by the collar mating with a taper on the outside of the split rings. All free play is thereby removed by preloaded force. A major object of the invention is to provide an ability to remove and replace individual tubular members without disturbing other structural parts of a truss structure. An additional anticipated use of this joint is to couple high pressure fluid lines. NASA



20

SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

N86-26368* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

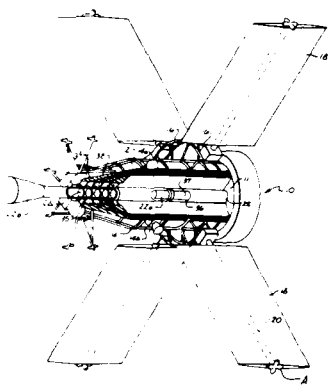
PROPULSION APPARATUS AND METHOD USING BOIL-OFF GAS FROM A CRYOGENIC LIQUID Patent

D. H. BLOUNT, inventor (to NASA) 29 Apr. 1986 7 p Supersedes N84-15183 Filed 29 Apr. 1986 Sponsored by NASA

(NASA-CASE-MFS-25946-1; US-PATENT-4,585,191; US-PATENT-APPL-SN-561432; US-PATENT-CLASS-244-169; US-PATENT-CLASS-244-158.R; US-PATENT-CLASS-60-203.1; US-PATENT-CLASS-60-39.465) Avail: US Patent and Trademark Office CSCL 21H

A propulsion system and method are disclosed for controlling the attitude and drag of a space vehicle. A helium dewar contains liquid helium which cools an experiment package. The helium is heated or vented to keep the temperature between 1.5 and 1.7 degrees K to maintain adequate helium boil-off gas as a propellant without adversely affecting the experiment package which is contained in the helium dewar for protection from solar heating. The apparatus includes auxiliary heater and temperature sensor for controlling the temperature of the helium. The boil-off gas

propellant is delivered to thruster modules to control vehicle attutude and compensate for drag.
Official Gazette of the U.S. Patent and Trademark Office



23

CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N86-32525* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
POLYMER OF PHOSPHONYLMETHYL-2,4- AND -2,6-DIAMINO BENZENE AND POLYFUNCTIONAL MONOMER Patent
J. A. MIKROYANNIDIS, inventor (to NASA) (National Academy of Sciences - National Research Council, Washington, D. C.) and D. A. KOURTIDES, inventor (to NASA) 6 May 1986 6 p Filed 16 Aug. 1984
(NASA-CASE-ARC-11506-2; US-PATENT-4,587,324; US-PATENT-APPL-SN-641142; US-PATENT-CLASS-528-108; US-PATENT-CLASS-528-124; US-PATENT-CLASS-528-337; US-PATENT-CLASS-528-352; US-PATENT-CLASS-528-399; US-PATENT-CLASS-528-406; US-PATENT-CLASS-528-407)
Avail: US Patent and Trademark Office CSCL 07A

A phosphonyl methyl benzene is prepared by nitration to produce a 2,4-dinitro phosphonyl methyl benzene, which is then reduced to a diamino compound. The diamino compound is then used to cure a polymerizable monomer. The diamino compound may be polymerized with polyfunctional epoxides to produce heat and fire resistant polymer structures for making flame and fire resistant polymer structures such as for aircraft secondary structures.
Official Gazette of the U.S. Patent and Trademark Office

N86-32526*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
POLYARYLENE ETHERS WITH IMPROVED PROPERTIES Patent Application
P. M. HERGENROTHER, inventor (to NASA), B. J. JENSEN, inventor (to NASA), and S. J. HAVENS, inventor (to NASA) (PRC Kentron, Inc., Hampton, Va.) 5 Jun. 1986 18 p
(NASA-CASE-LAR-13555-1; US-PATENT-APPL-SN-871207; NAS 1.71:LAR-13555-1) Avail: NTIS HC A02/MF A01 CSCL 07A

This invention relates to novel polyarylene ethers which possess the combination of high strength, toughness, and high use temperature with ease of extrusion and formation into complex objects. These polyarylene ethers are suitable for use in adhesives, coatings, films, membranes, and composite matrices. The polyarylene ethers of this invention are the polycondensation products from the reaction of either 1,3-bis (4-chloro or fluorobenzoyl) benzene with any one of the following bisphenolic compounds: bis (3-hydroxyphenyl) methane; bis (4-hydroxyphenyl) methane; 1,1-dimethyl-bis (4-hydroxyphenyl)methane, or 9,9-bis (4-hydroxyphenyl) fluorene. Random and block copolymers are also comprehended.
NASA

24

COMPOSITE MATERIALS

Includes laminates.

N86-25416* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LAMINATE COMPRISING FIBERS EMBEDDED IN CURED AMINE TERMINATED BIS-IMIDE Patent
D. KUMAR, inventor (to NASA) (National Academy of Sciences - National Research Council, Washington, D. C.), G. M. FOHLEN, inventor (to NASA), and J. A. PARKER, inventor (to NASA) 1 Apr. 1986 7 p Filed 30 Aug. 1985 Sponsored by NASA
(NASA-CASE-ARC-11421-3; US-PATENT-4,579-782; US-PATENT-APPL-SN-771538; US-PATENT-CLASS-428-473.5; US-PATENT-CLASS-428-474.4; US-PATENT-CLASS-428-477.7; US-PATENT-CLASS-528-170; US-PATENT-CLASS-528-220; US-PATENT-CLASS-528-321; US-PATENT-CLASS-528-322)
Avail: US Patent and Trademark Office CSCL 11D

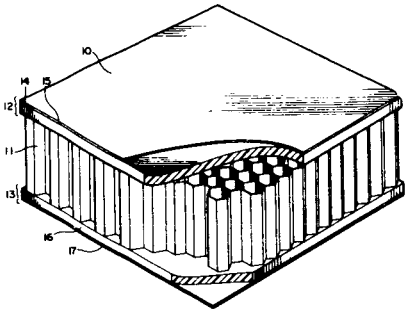
Amine terminated bisaspartimides are prepared by a Michael type reaction of an aromatic bismaleimide and an aromatic diamine in an aprotic solvent. These bisaspartimides are thermally polymerized to yield tough, resinous polymers crosslinked through -NH- groups. Such polymers are useful in applications requiring materials with resistance to change at elevated temperatures.
Official Gazette of the U.S. Patent and Trademark Office

N86-28131* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LIGHT WEIGHT FIRE RESISTANT GRAPHITE COMPOSITES Patent
D. A. KOURTIDES, J. A. PARKER, and M. T. S. HSU 1 Jul. 1986 12 p Filed 28 Feb. 1985 Supersedes N85-28976 (23 - 18, p 3068)
(NASA-CASE-ARC-11615-1SB; US-PATENT-4,598,007; US-PATENT-APPL-SN-706682; US-PATENT-CLASS-428-116; US-PATENT-CLASS-428-408; US-PATENT-CLASS-428-921; US-PATENT-CLASS-526-265) Avail: US Patent and Trademark Office CSCL 11D

Composite structures with a honeycomb core and characterized by lightweight and excellent fire resistance are provided. These sandwich structures employ facesheets made up of bismaleimide-vinyl styrylpyridine copolymers with fiber reinforcement such as carbon fiber reinforcement. In preferred embodiments the facesheets are over layered with a decorative

film. The properties of these composites make them attractive materials of construction aircraft and spacecraft.

Official Gazette of the U.S. Patent and Trademark Office



25

INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

N86-25428* National Aeronautics and Space Administration. Pasadena Office, Calif.

SOLAR HEATED OIL SHALE PYROLYSIS PROCESS Patent

S. A. QADER, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena) 15 Apr. 1985 7 p Filed 23 Jul. 1984 Supersedes N84-32912 Sponsored by NASA

(NASA-CASE-NPO-16392-1; US-PATENT-4,582,590; US-PATENT-APPL-SN-633363; US-PATENT-CLASS-208-11; US-PATENT-CLASS-48-197-R; US-PATENT-CLASS-8-DIG.9)

Avail: US Patent and Trademark Office CSCL 07D

An improved system for recovery of a liquid hydrocarbon fuel from oil shale is presented. The oil shale pyrolysis system is composed of a retort reactor for receiving a bed of oil shale particules which are heated to pyrolyis temperature by means of a recycled solar heated gas stream. The gas stream is separated from the recovered shale oil and a portion of the gas stream is rapidly heated to pyrolysis temperature by passing it through an efficient solar heater. Steam, oxygen, air or other oxidizing gases can be injected into the recycle gas before or after the recycle gas is heated to pyrolysis temperature and thus raise the temperature before it enters the retort reactor. The use of solar thermal heat to preheat the recycle gas and optionally the steam before introducing it into the bed of shale, increases the yield of shale oil.

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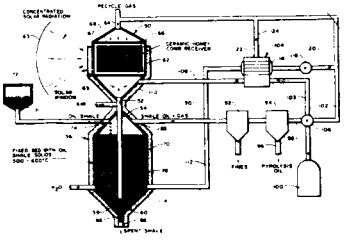

N86-27431* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SPILLAGE DETECTOR FOR LIQUID CHROMATOGRAPHY SYSTEMS Patent

M. J. JARVIS (Illinois Univ., Urbana) and D. S. FULTON, inventors (to NASA) 27 May 1986 12 p Filed 23 Mar. 1983 Supersedes N83-29325 (21 - 18, p 2890) Sponsored by NASA. Johnson Space Center

(NASA-CASE-MSC-20206-1; US-PATENT-4,591,838; US-PATENT-APPL-SN-478129; US-PATENT-CLASS-340-605; US-PATENT-CLASS-200-61.05; US-PATENT-CLASS-141-198)

Avail: US Patent and Trademark Office CSCL 07D

A spillage detector device for use in conjunction with fractionation of liquid chromatography systems which includes a spillage recieving enclosure beneath the fractionation area is described. A sensing device having a plurality of electrodes of alternating polarity is mounted within the spillage recieving enclosure. Detection circuitry, responsive to conductivity between electrodes, is operatively connected to the sensing device. The detection circuitry feeds into the output circuitry. The output circuit has relaying and switching circuitry directed to a solenoid, an alarm system and a pump. The solenoid is connected to the pliable conduit of the chromatography system. The alarm system comprises an audio alarm and a visual signal. A 115-volt power system interconnected with the pump, the solenoid, the sensing device, and the detection and output circuitry.

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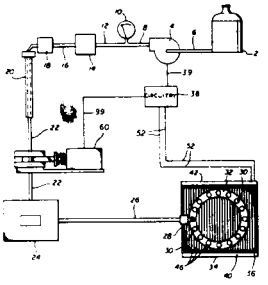


N86-32540*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ISOTOPE EXCHANGE IN OXIDE-CONTAINING CATALYST Patent Application

R. V. HESS, inventor (to NASA), B. T. UPCHURCH, inventor (to NASA), K. G. BROWN, inventor (to NASA) (Old Dominion Univ., Norfolk, Va.), I. M. MILLER, inventor (to NASA), D. R. SCHRYER, inventor (to NASA), B. D. SIDNEY, inventor (to NASA), G. M. WOOD, inventor (to NASA), and R. F. HOYT, inventor (to NASA) 12 Jun. 1986 11 p

(Contract NASA-ORDER L-79510-B; NASA-ORDER L-83135-B; NAS1-17993)

(NASA-CASE-LAR-13542-1SB; US-PATENT-APPL-SN-874304; NAS 1.71:LAR-13542) Avail: NTIS HC A02/MF A01 CSCL 07D

A method of exchanging rare-isotope oxygen for common-isotope oxygen in the top several layers of an oxide-containing catalyst is disclosed. A sample of an oxide-containing catalyst is exposed to a flowing stream of reducing gas in an inert carrier gas at a temperature suitable for the removal of the reactive common-isotope oxygen atoms from the surface layer or layers of the catalyst without damaging the catalyst structure. The reduction temperature must be higher than any at which the catalyst will subsequently operate. Sufficient reducing gas is used to allow removal of all of the reactive common-isotope oxygen atoms in the top several layers of the catalyst. The catalyst is then reoxidized with the desired rare-isotope oxygen in sufficient quantity to replace all of the common-isotope oxygen that was removed. NASA

N86-32541*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRETREATMENT AND REACTIVATION OF AN OXIDE-CONTAINING CATALYST Patent Application
B. T. UPCHURCH, inventor (to NASA), I. M. MILLER, inventor (to NASA), K. G. BROWN, inventor (to NASA), R. V. HESS, inventor (to NASA), D. R. SCHRYER, inventor (to NASA), B. D. SIDNEY, inventor (to NASA), G. M. WOOD, inventor (to NASA), and P. A. PAULIN, inventor (to NASA) 12 Jun. 1986 9 p
(Contract NASA ORDER-L-79510B; NASA ORDER-L-83135B; NAS1-17099)
(NASA-CASE-LAR-13540-1SB; US-PATENT-APPL-SN-874320; NAS 1.71:LAR-13540-1) Avail: NTIS HC A02/MF A01 CSCL 07D

A pretreatment and reactivation process for enhancing the recombination activity of an oxide-containing catalyst is disclosed. Pretreatment is achieved by first exposing the catalyst to a flowing stream of a reducing agent in an inert carrier gas while the catalyst is heated to a temperature greater than its operating temperature. The catalyst is then exposed to a flowing stream of the inert carrier gas in pure form at the same temperature. Finally, the catalyst is cooled to its operating temperature in a flowing stream of the inert carrier gas in pure form. Reactivation is achieved by merely reheating the catalyst, in the presence of CO-containing recombining gases, to a temperature greater than its operating temperature and then recooling the catalyst to its operating temperature. NASA

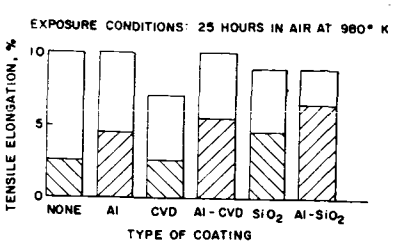
26

METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

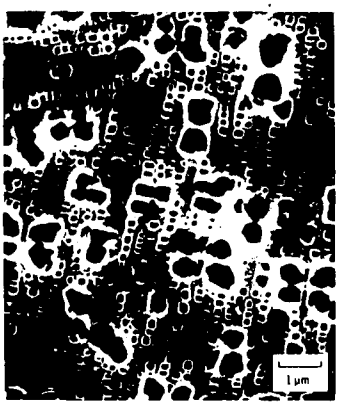
N86-24814*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DIFFUSION OXYGEN BARRIER COATING A02/MF A01 Patent Application
J. UNNAM, inventor (to NASA) (Analytical Services and Materials, Inc., Tabb, Va.) and R. K. CLARK, inventor (to NASA) 18 Mar. 1986 15 p
(NASA-CASE-LAR-13474-1-SB; NAS 1.71:LAR-13474-1-SB; US-PATENT-APPL-SN-840900) Avail: NTIS HC A02/MF A01 CSCL 11F

A method for coating a titanium panel or foil with aluminum and amorphous silicon to provide an oxygen barrier abrogating oxidation of the substrate metal is developed. The process is accomplished with known inexpensive procedures common in materials research laboratories, i.e., electron beam disposition and sputtering. The procedures are conductive to treating foil gage titanium and result in submicron layers which virtually add no weight to the titanium. There are no costly heating steps. The coatings blend with substrate titanium until separate mechanical properties are subsumed by those of the substrate eliminating cracking and spallation. This method appreciably increases the ability of titanium to perform in high thermal environments such as those witnessed on structures of space vehicles during re-entry. The novelty of this method is the ability to greatly enhance the operating envelope of titanium metal, particularly in thermal protection system applications. NASA



N86-26414*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HEAT TREATMENT FOR SUPERALLOY Patent Application
F. H. HARF, inventor (to NASA) 24 Feb. 1986 11 p
(NASA-CASE-LEW-14262-1; NAS 1.71:LEW-14261-1; US-PATENT-APPL-SN-832296) Avail: NTIS HC A02/MF A01 CSCL 11F

A cobalt-free nickel-base superalloy composed of in weight % 15 Cr - 5 Mo - 3.5 Ti - 4 Al - 0.07 (max) C - remainder Ni is given a modified heat treatment. With this heat treatment the cobalt-free alloy achieves certain of the mechanical properties of the corresponding cobalt-containing nickel-base superalloy at 1220 F (650 C). Thus, strategic cobalt can be replaced with nickel in the superalloy. NASA



N86-32550* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METHOD OF COATING A SUBSTRATE WITH A RAPIDLY SOLIDIFIED METAL Patent
H. P. CHU, inventor (to NASA) and C. L. STAUGAITIS, inventor (to NASA) 12 Nov. 1985 5 p Filed 19 Mar. 1984 Supersedes N84-20670 (22 - 11, p 1632)
(NASA-CASE-GSC-12880-1; US-PATENT-4,552,784; US-PATENT-APPL-SN-590925; US-PATENT-CLASS-427-192; US-PATENT-CLASS-427-191; US-PATENT-CLASS-427-421; US-PATENT-CLASS-427-427) Avail: US Patent and Trademark Office CSCL 11F

A method for coating a substrate with rapidly solidified metal is described which comprises spraying a mixture of rapidly solidified (RS) metal powder and small peening particles at high velocity against a substrate. The velocity is sufficient for the rapidly solidified metal powder and peening particles to impact the substrate and simultaneously bond the metal powder to the substrate. If the substrate is metallic, the method may provide the simultaneous mechanical working of the substrate surface.
Official Gazette of the U.S. Patent and Trademark Office

N86-32551* National Aeronautics and Space Administration. Pasadena Office, Calif.
APPARATUS FOR PRODUCTION OF ULTRAPURE AMORPHOUS METALS UTILIZING ACOUSTIC COOLING Patent
M. C. LEE, inventor (to NASA) 19 Nov. 1985 8 p Filed 21 Dec. 1982 Supersedes N83-19890 (21 - 10, p 1486)
(NASA-CASE-NPO-15658-1; US-PATENT-4,553,917; US-PATENT-APPL-SN-451896; US-PATENT-CLASS-425-6; US-PATENT-CLASS-65-21.2; US-PATENT-CLASS-65-142; US-PATENT-CLASS-73-505; US-PATENT-CLASS-219-121LE; US-PATENT-CLASS-219-121LY; US-PATENT-CLASS-264-5) Avail: US Patent and Trademark Office CSCL 11F

26 METALLIC MATERIALS

Amorphous metals are produced by forming a molten unit of metal and deploying the unit into a bidirectional acoustical levitating field or by dropping the unit through a spheroidizing zone, a slow quenching zone, and a fast quenching zone in which the sphere is rapidly cooled by a bidirectional jet stream created in the standing acoustic wave field produced between a half cylindrical acoustic driver and a focal reflector or a curved driver and a reflector. The cooling rate can be further augmented first by a cryogenic liquid collar and secondly by a cryogenic liquid jacket surrounding a drop tower. The molten unit is quenched to an amorphous solid which can survive impact in a unit collector or is retrieved by a vacuum chuck.

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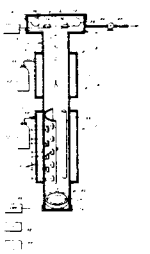


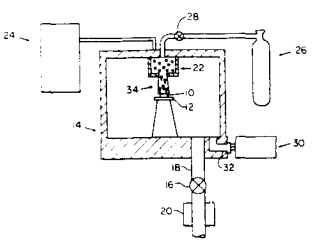
N86-32556*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ION-BEAM NITRIDING OF STEELS Patent Application

J. SALIK, inventor (to NASA) and T. E. HUBBELL, JR., inventor (to NASA) 29 Jan. 1986 11 p

(NASA-CASE-LEW-14104-2; US-PATENT-APPL-SN-823713; NAS 1.71:LEW-14104-2) Avail: NTIS HC A02/MF A01 CSCL 11F

A surface of a steel substrate is nitrided without external heating by exposing it to a beam of nitrogen ions under a low pressure. The pressure is much lower than that employed for ion-nitriding, and an ion source is used instead of a glow discharge. Both of these features reduce the introduction of impurities into the substrate surface. NASA



27

NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

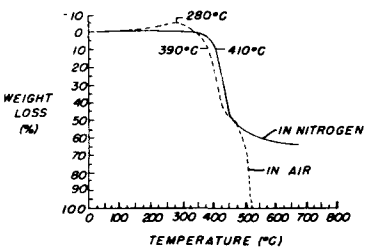
N86-24840*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PROCESS FOR CROSSLINKING METHYLENE-CONTAINING AROMATIC POLYMERS WITH IONIZING RADIATION Patent Application

V. L. BELL, inventor (to NASA) and S. J. HAVENS, inventor (to NASA) (Kentron International, Inc., Hampton, Va) 11 Mar. 1986 29 p

(NASA-CASE-LAR-13448-1; NAS 1.71:LAR-13448-1; US-PATENT-APPL-SN-838654) Avail: NTIS HC A03/MF A01 CSCL 11B

A process for crosslinking aromatic polymers containing radiation-sensitive methylene groups (-CH2-) by exposing the polymers to ionizing radiation thereby causing crosslinking of the polymers through the methylene groups is described. Crosslinked polymers are resistant to most organic solvents such as acetone, alcohols, hydrocarbons, methylene, chloride, chloroform, and other halogenated hydrocarbons,to common fuels and to hydraulic fluids in contrast to readily soluble uncrosslinked polymers. In addition, the degree of crosslinking of the polymers depends upon the percentage of the connecting groups which are methylene which ranges from 5 to 50% and preferably from 25 to 50% of the connecting groups, and is also controlled by the level of irradiation which ranges from 25 to 1000 Mrads and preferably from 25 to 250 Mrads. The temperature of the reaction conditions ranges from 25 to 200C and preferably at or slightly above the glass transition temperature of the polymer. The crosslinked polymers are generally more resistant to degradation at elevated temperatures such as greater than 150C, have a reduced tendency to creep under load, and show no significant embrittlement of parts fabricated from the polymers. NASA



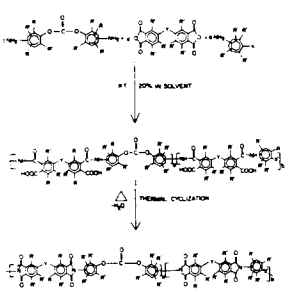
N86-24841*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

POLY(CARBONATE-MIDE) POLYMER Patent Application

T. L. ST.CLAIR, inventor (to NASA), S. MAUDGAL, inventor (to NASA), and J. R. PRATT, inventor (to NASA) (Mississippi Univ. For Women., Columbus) 27 Feb. 1986 25 p

(NASA-CASE-LAR-13292-1; NAS 1.71:LAR-13292-1; US-PATENT-APPL-SN-834978) Avail: NTIS HC A02/MF A01 CSCL 11B

A novel series of polymers and copolymers based on a polymide backbone with the incorporation of carbonate moieties along the backbone is presented. The preparation process for the polymers and copolymers is disclosed together with a novel series of dinitrodiphenyl carbonates and diaminodiphenyl carbonates. The novel polyners and copolymers exhibit high temperature capability and because of the carbonate unit, many exhibit a high degree of order and/or crystallinity. NASA

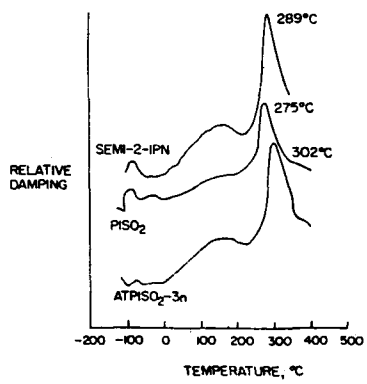


N86-25477*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS FOR CROSSLINKING AND EXTENDING CONJUGATED DIENE-CONTAINING POLYMERS Patent Application
V. L. BELL, inventor (to NASA) and S. J. HAVENS, inventor (to NASA) (PRC Kentron, Inc., Hampton, Va.) 11 Mar. 1986 17 p
(NASA-CASE-LAR-13452-1; NAS 1.71:LAR-13452-1;
US-PATENT-APPL-SN-838655) Avail: NTIS HC A02/MF A01
CSCL 11B

A process using a Diels-Adler reaction which increases the molecular weight and/or crosslinks polymers by reacting the polymers with bisunsaturated dienophiles is develoepd. The polymer comprises at least 75% by weight based on the reaction product, has a molecular weight of at least 5000 and a plurality of conjugated 1,3-diene systems incorporated into the molecular structure. A dienophile reaction with the conjugated 1,3-diene of the polymer is at least 1% by weight based on the reaction product. Examples of the polymer include polyesters, polyamides, polyethers, polysulfones and copolymers. The bisunsaturated dienophiles may include bis-maleimide, bisnadimides, bis maleic and bis tumaric esters and amides. This method for expanding the molecular weight chains of the polymers, preferably thermoplastics, is advantageous for processing or fabricating thermoplastics. A low molecular weight thermoplastic is converted to a high molecular weight plastic having improved strength and toughness for use in the completed end use article. NASA

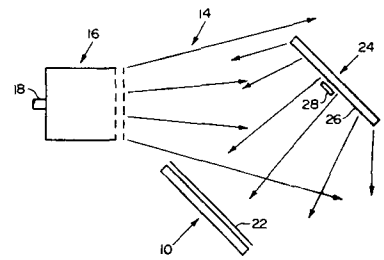
N86-25478*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SEMI-2-INTERPENETRATING NETWORKS OF HIGH TEMPERATURE SYSTEMS Patent Application
A. O. EGLI, inventor (to NASA) (Kentron International, Inc., Hampton, Va.) and T. L. ST.CLAIR, inventor (to NASA) 18 Mar. 1986 19 p
(NASA-CASE-LAR-13450-1; NAS 1.71:LAR-13450-1;
US-PATENT-APPL-SN-840816) Avail: NTIS HC A02/MF A01
CSCL 11B

A semi-2-interpenetrating network of improved qualities which is prepared by combining a linear polymer and a cross-linkable oligomer having identical repeating units is developed. Polymers have been combined in the past into interpentrating networks in order to gain useful properties from the combination of materials. However, previous semi-interpenetrating networks have only been formed using polymers having different repeating units. This method provides a semi-2-interpenetrating network of improved characteristics which is constructed by combining a linear polymer with a cross-linkable oligomer which has the same repeating unit as the linear polymer. The resulting interpenetrating network has improved properties over prior networks because the polymer and oligomer with identical functionalities are mutually soluble and form one homogeneous phase. This eliminates the phase separation problems common to other networks. NASA



N86-26434*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATION PROTECTING COATINGS FOR POLYMERS Patent Application
J. S. SOVEY, inventor (to NASA), B. A. BANKS, inventor (to NASA), and M. J. MIRTICH, inventor (to NASA) 27 Feb. 1986 12 p Sponsored by NASA
(NASA-CASE-LEW-14072-3; NAS 1.71:LEW-14072-3;
US-PATENT-APPL-SN-834977) Avail: NTIS HC A02/MF A01
CSCL 11B

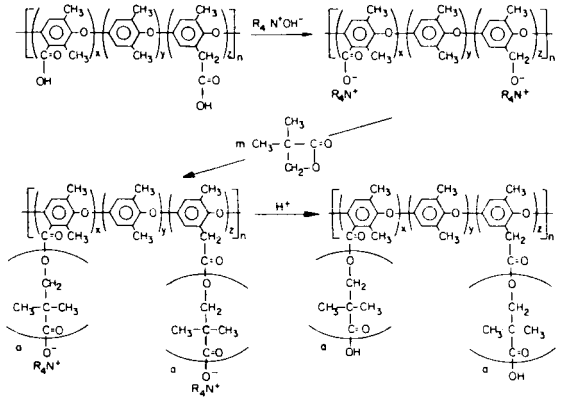
A polymeric substrate is coated with a metal oxide film to provide oxidation protection in low Earth orbital environments. The film contains about four volume percent polymer to provide flexibility. NASA



N86-26435*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
POLYETHER-POLYESTER GRAFT COPOLYMER Patent Application
V. L. BELL, inventor (to NASA) 24 Apr. 1986 20 p Sponsored by NASA
(NASA-CASE-LAR-13447-1; NAS 1.71:LAR-13447-1;
US-PATENT-APPL-SN-855879) Avail: NTIS HC A02/MF A01
CSCL 11B

This invention relates to a polyether graft copolymer having improved solvent resistance and crystalline thermally reversible crosslinks. The copolymer is prepared by a novel process of anionic copolymerization. The polymers of this invention exhibit good solvent resistance and are well suited for commercial aircraft parts. Previous aromatic polyethers, also well known as polyphenylene oxides, have certain deficiencies which detract from their usefulness. These well known commercial polymers are often soluble in common solvents including the halocarbon and aromatic hydrocarbon types of paint thinners and removers. This limitation prevents the use of these polyethers in structural articles that require frequent painting. In addition, the most popular commercially available polyether is a very high melting plastic. This makes it considerably more difficult to fabricate finished parts from this material. The present invention solves these problems by providing an aromatic polyether graft copolymer with improved solvent resistance and crystalline thermally reversible crosslinks. The graft copolymer is formed by converting the carboxyl groups of a carboxylated polyphenylene oxide polymer to ionic carbonyl groups in a suitable solvent, reacting pivalolactone with the dissolved

polymer, and adding acid to the solution to produce the graft copolymer. NASA



N86-27450* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SULFONE-ESTER POLYMERS CONTAINING PENDENT ETHYNL GROUPS Patent
P. M. HERGENROTHER and B. J. JENSEN, inventors (to NASA) 6 May 1986 8 p Filed 23 May 1984 Supersedes N84-28987 (22 - 19, p 2996) Sponsored by NASA. Langley Research Center
(NASA-CASE-LAR-13316-1; US-PATENT-4,587,312; US-PATENT-APPL-SN-613139; US-PATENT-CLASS-525-535; US-PATENT-CLASS-260-544P; US-PATENT-CLASS-525-534; US-PATENT-CLASS-526-285; US-PATENT-CLASS-528-171; US-PATENT-CLASS-528-174; US-PATENT-CLASS-528-176)
Avail: US Patent and Trademark Office CSCL 11B

Sulfone ester polymers containing pendent ethynl groups and a direct and multistep process for their preparation are disclosed. The process involves the conversion of a pendent bromo group to the ethynyl group while the direct route involves reacting hydroxy-terminated sulfone oligomer or polymers with a stoichiometric amount of 5(4-ethynyl phenoxy)isophthaloyl chloride. The 5(4-ethynyl phenoxy)isophthaloyl chloride synthesis procedures are also disclosed.

Official Gazette of the U. S. Patent and Trademark Office

N86-27451* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TOUGHENING REINFORCED EPOXY COMPOSITES WITH BROMINATED POLYMERIC ADDITIVES Patent
Z. NIR, Inventor (to NASA) (National Academy of Sciences - National Research Council, Washington, D. C.) and W. J. GILWEE, JR., Inventor (to NASA) 15 Aug. 1985 13 p
(NASA-CASE-ARC-11427-2; US-PATENT-4,588,778; US-PATENT-APPL-SN-765-980; US-PATENT-CLASS-525-115; US-PATENT-CLASS-525-119; US-PATENT-CLASS-525-122; US-PATENT-CLASS-525-108; US-PATENT-CLASS-523-434; US-PATENT-CLASS-523-445; US-PATENT-CLASS-523-461)
Avail: US Patent and Trademark Office CSCL 11B

Cured polyfunctional epoxy resins including tris(hydroxyphenyl)methane triglycidyl ether are toughened by addition of polybrominated polymeric additives having an EE below 1500 to the pre-cure composition. Carboxy-terminated butadiene-acrylonitrile rubber is optionally present in the pre-cure mixture as such or as a pre-formed copolymer with other reactants. Reinforced composites, particularly carbon-reinforced composites, of these resins are disclosed and shown to have improved toughness.

Official Gazette of the U.S. Patent and Trademark Office

N86-29039* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS FOR PREPARING ESSENTIALLY COLORLESS POLYIMIDE FILM CONTAINING PHENOXY-LINKED DIAMINES Patent
A. K. STCLAIR and T. L. STCLAIR 17 Jun. 1986 8 p Filed 23 Aug. 1984 Supersedes N85-20128 (23 - 11, p 1611)
(NASA-CASE-LAR-13353-1; US-PATENT-4,595,548; US-PATENT-APPL-SN-643524; US-PATENT-CLASS-264-236; US-PATENT-CLASS-264-204; US-PATENT-CLASS-264-216; US-PATENT-CLASS-264-347; US-PATENT-CLASS-528-222; US-PATENT-CLASS-528-341; US-PATENT-CLASS-528-183)
Avail: US Patent and Trademark Office CSCL 11C

A polyimide film that is approximately 90% transparent at 500 nm, useful for thermal protective coatings and solar cells, and the processes for preparing the same by thermal and chemical conversion are disclosed. An essential feature for achieving maximum optical transparency films requires utilizing recrystallized and/or sublimated specific aromatic diamines and dianhydride monomers and introducing phenoxy or thiophenyl separator groups and isomeric m,m' or o,p'-oriented diamines into the polymer molecular structure. The incorporation of these groups in the polymer structure serves to separate the chromaphoric centers and reduce the formation of inter-chain and intra-chain charge transfer complexes which normally cause absorptions in the UV-visible range. The films may be obtained by hand, brushing, casting, or spraying a layer of polyamic acid solutions onto a surface and thermally converting the applied layer to the polyimide, or the polyamic acid solution can be chemically converted to the polyimide, subsequentially dissolved in an organic solvent, and applied as a polyimide film layer with the solvent therein thermally removed.

Official Gazette of the U.S. Patent and Trademark Office

N86-31726*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMINE TERMINATED BISASPARTIMIDE POLYMER Patent
D. KUMAR, inventor (to NASA) (National Academy of Sciences - National Research Council, Washington, D. C.), G. M. FOHLEN, inventor (to NASA), and J. A. PARKER, inventor (to NASA) 15 Jul. 1986 8 p Filed: May 31, 1985
(NASA-CASE-ARC-11421-2; US-PATENT-4,600,769; US-PATENT-APPL-SN-739760; US-PATENT-CLASS-528-322; US-PATENT-CLASS-428-473.5; US-PATENT-CLASS-528-170; US-PATENT-CLASS-528-220; US-PATENT-CLASS-528-321)
Avail: US Patent and Trademark Office CSCL 11B

Novel amine terminated bisaspartimides are prepared by a Michael-type reaction of an aromatic bismalteimide and an aromatic diamine in an aprotic solvent. These bisaspartimides are thermally polymerized to yield tough, resinous polymers cross-lined through -NH- groups. Such polymers are useful in applications requiring materials with resistance to change at elevated temperatures, e.g., as lightweight laminates with graphite cloth, molding material prepregs, adhesives and insulating material.

Official Gazette of the U.S. Patent and Trademark Office

N86-31727* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS FOR PREPARING HIGHLY OPTICALLY TRANSPARENT/COLORLESS AROMATIC POLYIMIDE FILM Patent

A. K. ST.CLAIR, inventor (to NASA) and T. L. ST.CLAIR, inventor (to NASA) 29 Jul. 1986 9 p Filed 23 Aug. 1984 Supersedes N85-21360 (23 - 12, p 1811)
(NASA-CASE-LAR-13351-1; US-PATENT-4,603,061; US-PATENT-APPL-SN-643589; US-PATENT-CLASS-427-162; US-PATENT-CLASS-264-212; US-PATENT-CLASS-264-236; US-PATENT-CLASS-427-164; US-PATENT-CLASS-427-165; US-PATENT-CLASS-428-336; US-PATENT-CLASS-428-473.5)
Avail: US Patent and Trademark Office CSCL 11B

An aromatic condensation polyimide film that is approximately 90% transparent at 500 nm, useful for thermal protective coatings and the process for preparing same are disclosed. A feature to achieve maximum optical transparency films requires the utilization of recrystallized and/or sublimated specific aromatic diamines and dianhydride monomers and the introduction of bulky electron withdrawing groups and separator groups into the polymer molecular structure.

Official Gazette of the U.S. Patent and Trademark Office

N86-32568*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIRE RESISTANT POLYAMIDE BASED ON 1-(DIORGANOOXYPHOSPHONYL)METHYL-2,4- AND -2,6DIAMINO BENZENE Patent
J. A. MIKROYANNIDIS, inventor (to NASA) and D. A. KOURTIDES, inventor (to NASA) 22 Jul. 1986 8 p Filed 16 Aug. 1984 Supersedes N85-21362 (24 - 11, p 1872)
(NASA-CASE-ARC-11512-2; US-PATENT-4,602,081; US-PATENT-CLASS-528-337; US-PATENT-CLASS-528-336; US-PATENT-CLASS-528-340; US-PATENT-CLASS-528-347; US-PATENT-CLASS-564-15; US-PATENT-CLASS-568-14; US-PATENT-APPL-SN-641153) Avail: US Patent and Trademark Office CSCL 11B

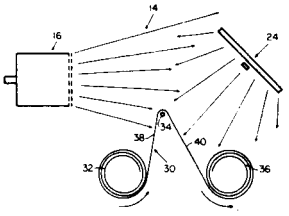
1-(Diorganooxyphosphonyl)methyl2,4- and-2,6diamino benzenes are reacted with polyacylhalides and optionally comonomers to produce polyamides which have desirable heat and fire resistance properties. These polymers are used to form fibers and fabrics where fire resistance properties are important, e.g., aircraft equipment and structures.

Official Gazette of the U.S. Patent and Trademark Office

N86-32569* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPARATUS FOR PRODUCING OXIDATION PROTECTION COATINGS FOR POLYMERS Patent
M. J. MIRTICH, inventor (to NASA), J. S. SOVEY, inventor (to NASA), and A. BANKS, inventor (to NASA) 5 Aug. 1986 7 p Division of US-Patent-Appl-SN-649330, 14 Sep. 1984, US-Patent-4,560,577 Filed 31 Jul. 1985 Supersedes N86-19463 (24 - 10, p 1560)
(NASA-CASE-LEW-14072-2; US-PATENT-4,604,181; US-PATENT-APPL-SN-761235; US-PATENT-CLASS-204-298; US-PATENT-CLASS-204-192C; US-PATENT-CLASS-204-192D)
Avail: US Patent and Trademark Office CSCL 11B

A polymeric substrate is coated with a metal oxide film to provide oxidation protection in low Earth orbital environments. The film contains about 4 volume percent polymer to provide flexibility. A coil of polymer materials moves through an ion beam as it is fed between reels. The ion beam first cleans the polymer material surface and then sputters the film material from a target onto this surface.

Official Gazette of the U.S. Patent and Trademark Office



N86-32570*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CELLULAR THERMOSETTING FLUOROPOLYMERS AND PROCESS FOR MAKING THEM Patent Application
S. Y. LEE 29 May 1986 12 p
(NASA-CASE-GSC-13008-1; US-PATENT-APPL-SN-867987; NAS 1.71:GSC-13008-1) Avail: NTIS HC A02/MF A01 CSCL 11B

Thermosetting fluoropolymer foams are made by mixing fluid form thermosetting fluoropolymer components having a substantial fluorine content, placing the mixture in a pressure tight chamber, filling the chamber with a gas, at relatively low pressure, that is unreactive with the fluoropolymer components, allowing the mixture to gel, removing the gelled fluoropolymer from the chamber and thereafter heating the fluoropolymer at a relatively low temperature to simultaneously cure and foam the fluoropolymer. The resulting fluoropolymer product is closed celled with the cells storing the gas employed for foaming. The fluoropolymer resins employed may be any thermosetting fluoropolymer including fluoroepoxies, fluoropolyurethanes and fluoroacrylates. NASA

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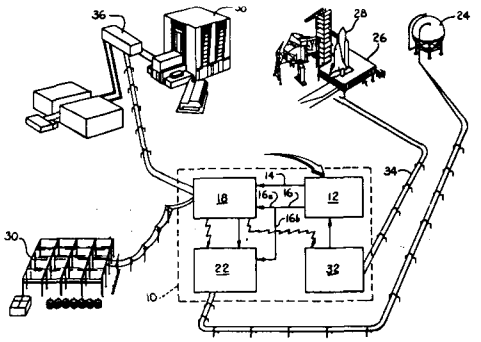
PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

N86-23744*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
LIQUID HYDROGEN POLYGENERATION SYSTEM AND PROCESS Patent Application
P. A. MINDERMAN, G. P. GUTKOWSKI, L. MANFREDI, J. V. KING, and F. S. HOWARD, inventors (to NASA) 15 Nov. 1985 23 p
(NASA-CASE-KSC-11304-2; NAS 1.71:KSC-11304-2; US-PATENT-APPL-SN-789713) Avail: NTIS HC A02/MF A01 CSCL 21I

An integrated polygeneration system and process is disclosed for generating liquid hydrogen as a main energy product for use as a propellant for space vehicles. Secondary energy products and commodities for supporting a space center complex and launching of the space vehicle includes the production of electrical and thermal energy and gaseous nitrogen. The integrated process includes a coal gasification and gas cleanup system, a combined cycle power generation system, a hydrogen production and liquefaction system and a air separation system. A medium BTU gas is produced by the coal gasification system. Steam also

produced in the coal gasification process is delivered to a steam turbine in the combined cycle power generation system. NASA



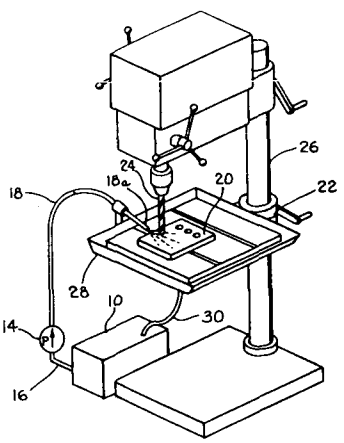
31

ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

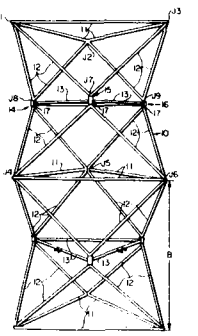
N86-23750*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD FOR MACHINING HOLES IN COMPOSITE MATERIALS Patent Application
J. M. CLEMONS, F. E. LEDBETTER, J. G. DANIELS, and B. G. PENN, inventors (to NASA) 3 Dec. 1985 9 p
(NASA-CASE-MFS-28044-1; NAS 1.71:MFS-28044-1; US-PATENT-APPL-SN-804039) Avail: NTIS HC A02/MF A01 CSCL 13H

A method for boring well defined holes in a composite material such as graphite/epoxy is discussed. A slurry of silicon carbide powder and water is projected onto a work area of the composite material in which a hole is to be bored with a conventional drill bit. The silicon carbide powder and water slurry allow the drill bit, while experiencing only normal wear, to bore smooth, cylindrical holes in the composite material. NASA



N86-24867*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEPLOYABLE GEODESIC TRUSS STRUCTURE A01 Patent Application
M. M. MIKULAS, JR., inventor (to NASA), M. D. RHODES, inventor (to NASA), and J. W. SIMONTON, inventor (to NASA) 20 Feb. 1986 15 p
(NASA-CASE-LAR-13113-1; NAS 1.71:LAR-13113-1; US-PATENT-APPL-SN-831371) Avail: NTIS HC A02/MF A01 CSCL 13B

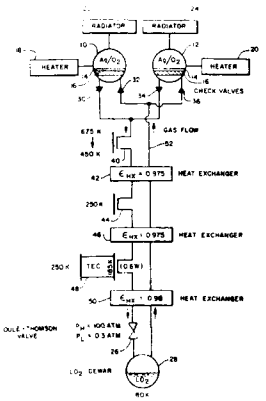
A deployable geodesic truss structure which can be deployed from a stowed state to an erected state is described. The truss structure includes a series of bays, each bay having sets of battens connected by longitudinal cross members which give the bay its axial and torsional stiffness. The cross members are hinged at their mid point by a joint so that the cross members are foldable for deployment or collapsing. The bays are deployed and stabilized by actuator means connected between the mid point joints of the cross members. Hinged longerons may be provided to also connect the sets of battens and to collapse for stowing with the rest of the truss structure. The truss structure has the capability of serving a structural function even when only partly deployed. NASA



N86-27467*# National Aeronautics and Space Administration. Pasadena Office, Calif.
OXYGEN CHEMISORPTION CRYOGENIC REFRIGERATOR Patent Application
J. A. JONES, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena) 24 Apr. 1986 15 p Sponsored by NASA
(NASA-CASE-NPO-16734-1-CU; NAS 1.71:NPO-16734-1-CU; US-PATENT-APPL-SN-855982) Avail: NTIS HC A02/MF A01 CSCL 13I

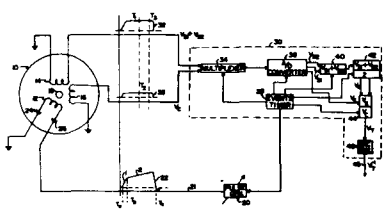
The present invention relates to a chemisorption compressor cryogenic refrigerator which employs oxygen to provide cooling at 60 K to 100 K. The invention includes dual vessels containing an oxygen absorbent material, alternately heated and cooled to provide a continuous flow of high pressure oxygen, multiple heat exchangers for precooling the oxygen, a Joule-Thomson expansion valve system for expanding the oxygen to partially liquefy it and a liquid oxygen collection vessel. The primary novelty of the present invention lies in the provision of a refrigeration system which makes

use of reversible chemical reactions with oxygen to provide cooling at 60 K to 100 K. NASA



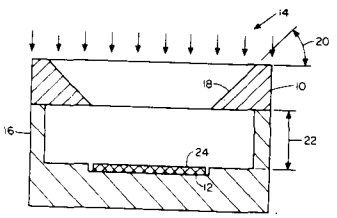
N86-29055* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ANGULAR MEASUREMENT SYSTEM Patent
J. R. CURRIE and R. R. KISSEL 10 Jun. 1986 6 p Filed 3 Oct. 1984 Supersedes N85-20298 (23 - 11, p 1635)
(NASA-CASE-MFS-25825-1; US-PATENT-4,594,540; US-PATENT-APPL-SN-657309; US-PATENT-CLASS-318-661; US-PATENT-CLASS-340-347SY; US-PATENT-CLASS-340-347CC; US-PATENT-CLASS-318-636; US-PATENT-CLASS-318-605)
Avail: US Patent and Trademark Office CSCL 13B

A system for the measurement of shaft angles is disclosed wherein a synchro resolver is sequentially pulsed, and alternately, a sine and then a cosine representative voltage output of it are sampled. Two like type, sine or cosine, succeeding outputs (V sub S1, V sub S2) are averaged and algebraically related to the opposite type output pulse (V sub c) occurring between the averaged pulses to provide a precise indication of the angle of a shaft coupled to the resolver at the instant of the occurrence of the intermediately occurring pulse (V sub c).
Official Gazette of the U.S. Patent and Trademark Office



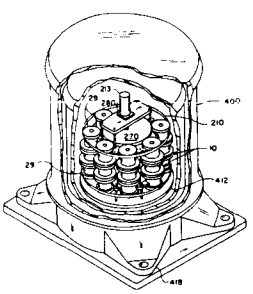
N86-32587* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEXTURED CARBON SURFACES ON COPPER BY SPUTTERING Patent
A. N. CURREN, inventor (to NASA), K. A. JENSEN, inventor (to NASA), and R. F. ROMAN, inventor (to NASA) 19 Aug. 1986 8 p Filed 10 Oct. 1984 Supersedes N85-20151 (23 - 11, p 1615)
(NASA-CASE-LEW-14130-1; US-PATENT-4,607,193; US-PATENT-APPL-SN-659475; US-PATENT-CLASS-315-5.38; US-PATENT-CLASS-204-192C; US-PATENT-CLASS-204-192D; US-PATENT-CLASS-204-298; US-PATENT-CLASS-313-106; US-PATENT-CLASS-313-107; US-PATENT-CLASS-427-39)
Avail: US Patent and Trademark Office CSCL 13H

A very thin layer of highly textured carbon is applied to a copper surface by a triode sputtering process. A carbon target and a copper substrate are simultaneously exposed to an argon plasma in a vacuum chamber. The resulting carbon surface is characterized by a dense, random array of needle like spires or peaks which extend perpendicularly from the copper surface. The coated copper is especially useful for electrode plates in multistage depressed collectors.
Official Gazette of the U.S. Patent and Trademark Office



N86-32589*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REMOTELY CONTROLLABLE MIXING SYSTEM Patent Application
R. R. BELEW, inventor (to NASA) 18 Jun. 1986 19 p
(NASA-CASE-MFS-28153-1; US-PATENT-APPL-SN-875891; NAS 1.71:MFS-28153-1) Avail: NTIS HC A02/MF A01 CSCL 13H

This invention relates to a remotely controllable mixing system in which a plurality of mixing assemblies are arranged in an annular configuration, and wherein each assembly employs a central chamber and two outer, upper and lower chambers. Valves are positioned between chambers, and these valves for a given mixing assembly are operated by upper and lower control rotors, which in turn are driven by upper and lower drive rotors. Additionally, a hoop is compressed around upper control rotors and a hoop is compressed around lower control rotors to thus insure constant frictional engagement between all control rotors and drive rotors. The drive rollers are driven by a motor. NASA



32

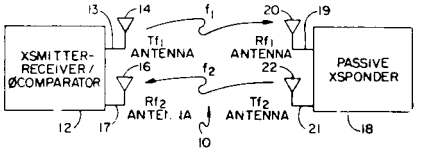
COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

N86-24879*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD AND APPARATUS FOR MEASURING DISTANCE

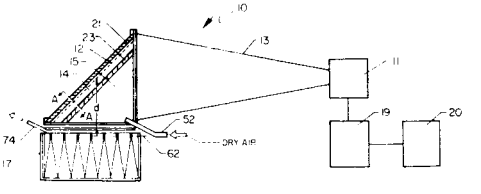
Patent Application
C. L. LICHTENBERG, inventor (to NASA), P. W. SHORES, inventor (to NASA), and H. S. KOBAYASHI, inventor (to NASA) 20 Feb. 1986 34 p
(NASA-CASE-MSC-20912-1; NAS 1.71:MSC-20912-1; US-PATENT-APPL-SN-831183) Avail: NTIS HC A03/MF A01 CSCL 17I

The invention employs a continuous wave radar technique and apparatus which can be used as a distance measuring system in the presence of background clutter, by utilizing small passive transponders. A first continuous electromagnetic wave signal S sub 1 at a first frequency f sub 1 is transmitted from a first location. A transponder carried by a target object positioned at a second (remote) location receives the transmitted signal, phase-coherently divides the f sub 1 frequency and phase therefore, and re-transmits the transmitted signal as a second continous electromagnet wave signal S sub 2 at a lower second frequency f sub 2 which is a subharmonic of f sub 1. The re-transmitted signal is received at the first location where a measurement of the phase difference is made between the signals S sub 1 and S sub 2, such measurement being indicative of the distance between the first and second locations. In a preferred embodiment, the transponder is a passive divide-by-two parametric oscillator employing the energy from the transmitted signal S sub 1 incident thereon to generate the re-transmitted signal S sub 2. NASA



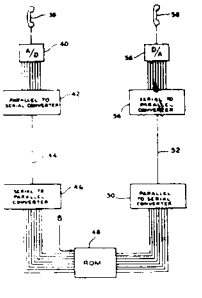
N86-24880*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MEASUREMENT APPARATION AND PROCEDURE FOR THE DETERMINATION OF SURFACE EMISSIVITIES Patent Application
H. J. C. BLUME, inventor (to NASA) 3 Dec. 1985 27 p
(NASA-CASE-LAR-13455-1; NAS 1.71:LAR-13455-1; US-PATENT-APPL-SN-804040) Avail: NTIS HC A03/MF A01 CSCL 20N

A method and apparatus for independently determining the electromagnetic surface emissivity of a material is developed, which is particularly useful in the design of large deployable space antennas employing mesh membrane surfaces. The system is a closed one with respect to unwanted or uncorrelated radiation outside the system. The present embodiment comprises a radiometer connected to a horn antenna, a test section sealed to the horn antenna and a cryogenically cooled matched load (cryoload) exposed to the interior of the system. The material is enclosed in a convection test chamber within the test section, heated by convection within a test chamber and allowed to radiate within the system such that a component of the radiation energy of the material is measured by the radiometer in terms of brightness temperature. A matched load serves as the stabilized source of uncorrelated radiation within the system. The actual physical temperature of the material is also measured during the heating process with a thermometer. The difference in brightness temperature over a selected period of time when divided by the physical temperature over the same period of time is the emissivity of the material according to a derivation of the Raleigh - Jeans approximation for an ideal system free from all uncorrelated radiation. NASA



N86-27513* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
METHOD AND APPARATUS FOR OPERATING ON COMPANDED PCM VOICE DATA Patent
F. BYRNE, inventor (to NASA) 13 May 1986 8 p Filed 28 Sep. 1984 Supersedes N85-29120 (23 - 18, p 3089) Sponsored by NASA. Kennedy Space Center
(NASA-CASE-KSC-11285-1; US-PATENT-4,588,986; US-PATENT-APPL-SN-655601; US-PATENT-CLASS-340-347DD; US-PATENT-CLASS-365-768; US-PATENT-CLASS-179-18BC) Avail: US Patent and Trademark Office CSCL 17B

The method and apparatus constructed in accordance with this invention permits a plurality of parties to speak to each other on a conference line with a minimum of interference. The apparatus digitizes audio signals. Each of the parties has an audio transmitter and receiver provided for transmitting and receiving audio signals. The audio signals are converted to a PCM companded eight-bit parallel signal followed by a conversion to a serial signal for transmitting to a remote location and then reconverting each of the companded signals to a first-eight-bit parallel signal. The eight-bit parallel signal is fed to one input of a pre-programmed ROM. This eight-bit signal provides one-half of a sixteen-bit address of a lookup ROM. The other half of the sixteen-bit ROM address is supplied by another suscriber over an identical circuit.
Official Gazette of the U.S. Patent and Trademark Office



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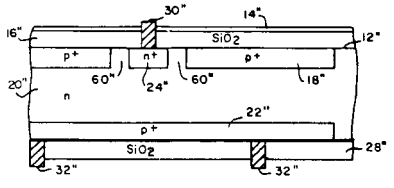
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuity.

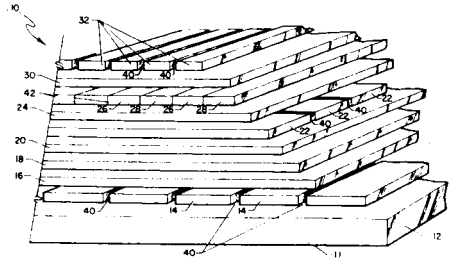
N86-24908*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FLOATING EMITTER SOLAR CELL JUNCTION TRANSISTOR Patent Application
C. T. SAH, inventor (to NASA) and L. J. CHENG, inventor (to NASA) 11 Mar. 1986 26 p
(Contract NAS7-919)
(NASA-CASE-NPO-16467-1-CU; NAS 1.71:NPO-16467-1-CU; US-PATENT-APPL-SN-838648) Avail: NTIS HC A03/MF A01 CSCL 09A

A front surface contact floating emitter solar cell transistor is provided in a semiconductor body (n-type), in which floating emitter sections (p-type) are diffused or implanted in the front surface. Between the emitter sections, a further section is diffused or implanted in the front surface, but isolated from the floating emitter sections, for use either as a base contact to the n-type semiconductor body, in which case the section is doped n+, or as a collector for the adjacent emitter sections, in which case the section is doped p+. In the first case, the structure is diffused or implanted p+ on the back in a section that serves as a collector, and in the second case the structure is diffused or implanted n+ all across the back to serve as a base contact. In either case, the semiconductor material on the back may be a starting substrate of suitably doped semiconductor material. A major advantage is that no wafer edge groove is necessary since the floating emitter solar cell transistors are isolated from saw damge, so long as a cut is not made through the well. NASA



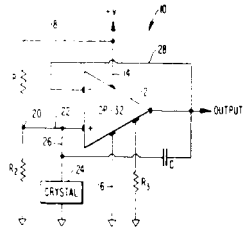
N86-24909*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLAT-PANEL, FULL-COLOR ELECTROLUMINESCENT DISPLAY Patent Application
J. B. ROBERTSON, inventor (to NASA) 3 Dec. 1985 13 p
(NASA-CASE-LAR-13407-1; NAS 1.71:LAR-13407-1; US-PATENT-APPL-SN-804196) Avail: NTIS HC A02/MF A01 CSCL 09A

This invention relates to a flat-panel, electroluminescent display capable of achieving full color and is particularly useful in achieving a bright display with high resolution. The invention uses red, green and blue phosphors in two layers separated by layers of insulating material and layers of electrodes that are used to excite the electrodes. In operation, the display is addressed by supplying sufficient voltage between selected electrodes. This places an electric field across the phosphor at each picture element located between the overlap of the selected electrodes, causing the phosphor to emit light at this location. The display can be addressed in line-at-a-time fashion in rapid enough sequence to display information at standard TV frame rates. The novelty of this invention resides in the combining of a partial side-by-side design with a partial stacked layer design to produce a flat-panel, full-color display which has a better combination of resolution, brightness, contrast ratio and fabrication simplicity than any of the prior designs. NASA



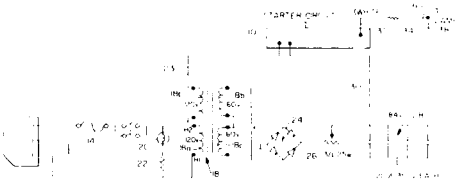
N86-32624* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TEMPERATURE SENSITIVE OSCILLATOR Patent
L. L. KLEINBERG, inventor (to NASA) 29 Jul. 1986 7 p Filed 25 Apr. 1985 Supersedes N85-30201 (23 - 19, p 3258)
(NASA-CASE-GSC-12958-1; US-PATENT-4,603,306; US-PATENT-APPL-SN-727035; US-PATENT-CLASS-331-66; US-PATENT-CLASS-331-108D; US-PATENT-CLASS-331-116R; US-PATENT-CLASS-374-183) Avail: US Patent and Trademark Office CSCL 09A

An oscillator circuit for sensing and indicating temperature by changing oscillator frequency with temperature comprises a programmable operational amplifier which is operated on the roll-off portion of its gain versus frequency curve and has its output directly connected to the inverting input to place the amplifier in a follower configuration. Its output is also connected to the non-inverting input by a capacitor with a crystal or other tuned circuit also being connected to the non-inverting input. A resistor is connected to the program input of the amplifier to produce a given set current at a given temperature, the set current varying with temperature. As the set current changes, the gain-bandwidth of the amplifier changes and, in turn, the reflected capacitance across the crystal changes, thereby providing the desired change in oscillator frequency by pulling the crystal. There is no requirement that a crystal employed with this circuit display either a linear frequency change with temperature or a substantial frequency change with temperature.
Official Gazette of the U.S. Patent and Trademark Office



N86-32626*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ARC LAMP POWER SUPPLY Patent Application
B. D. LEIGHTY, inventor (to NASA) 26 Jun. 1986 11 p
(NASA-CASE-LAR-13202-1; US-PATENT-APPL-SN-879758; NAS 1.71:LAR-13202-1) Avail: NTIS HC A02/MF A01 CSCL 09A

A power supply is provided for an arc discharge lamp which includes a relatively low voltage high current power supply section and a high voltage starter circuit. The low voltage section includes a transformer, rectifier, variable resistor and a bank of capacitors, while the starter circuit comprises a plurality of diodes and capacitors connected as a Cockcroft-Walton multiplier. The starting circuit is effectively bypassed when the lamp arc is established and serves to automatically provide a high starting voltage to re-strike the lamp arc if the arc is extinguished by a power interruption. NASA



N86-26575*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ACTIVE CONTROL OF BOUNDARY LAYER TRANSITION AND TURBULENCE Patent Application
L. MAESTRELLO, inventor (to NASA) 11 Mar. 1986 13 p
(NASA-CASE-LAR-13532-1; NAS 1.71:LAR-13532-1; US-PATENT-APPL-SN-838649) Avail: NTIS HC A02/MF A01 CSCL 20D

The invention is a system and method for controlling boundary layer flow such that flow separation can be delayed and skin friction drag can be reduced. The invention consists of heater elements used to trigger turbulent flow and audio speakers used to suppress turbulent oscillations. By inducing turbulent oscillations into the flow in a region of positive pressure gradient, pressure patterns became more regular. The suppression of these patterns can be accomplished by imposing an out-of-phase suppressing wave. This wave is the audio output generated by a feedback amplifier using inputs from a hot-wire anemometer reading downstream turbulence. The novel features of the present invention are the tripping of boundary layer flow in a region of positive pressure gradient and the cooperative use of the feedback means to control turbulence. The result is a significant reduction in drag and separation problems. NASA

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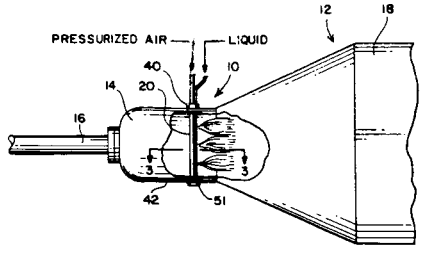
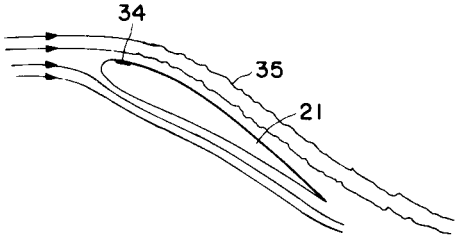
FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

N86-24935*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LIQUID SEEDING ATOMIZER Patent Application
H. L. B. SEEGMILLER, inventor (to NASA) 31 Mar. 1986 12 p
(NASA-CASE-ARC-11631-1; NAS 1.71:ARC-11631-1; US-PATENT-APPL-SN-846428) Avail: NTIS HC A02/MF A01 CSCL 20D

An atomizer for a liquid having an air supply is described. Liquid supply tubes extend longitudinally along the air supply tube. The air supply tube has at least one air orifice extending from an inner surface of the tube through the tube. The liquid supply tubes are positioned on either side of the air orifices and the liquid tubes are sealed to the air supply tube. The liquid supply tubes with facing liquid orifices are positioned adjacent to each of the air orifices. The liquid supply tubes are laterally spaced apart at the liquid orifices at a distance less than the diameter of the air orifices to enable a beneficial venturi effect when the atomizer is in operation. NASA





N86-27593* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MULTI-LEG HEAT PIPE EVAPORATOR Patent
J. P. ALARIO (Grumman Aerospace Corp., Bethpage, N.Y.) and R. A. HASLETT, inventors (to NASA) 22 Apr. 1986 7 p Filed 31 May 1984 Supersedes N84-32748 (22 - 22, p 3592) Sponsored by NASA. Johnson Space Center
(NASA-CASE-MSC-20812-1; US-PATENT-4,583,587; US-PATENT-APPL-SN-616002; US-PATENT-CLASS-165-104.26; US-PATENT-CLASS-122-366; US-PATNET-CLASS-165-41; US-PATENT-CLASS-165-104.14) Avail: US Patent and Trademark Office CSCL 20D

A multileg heat pipe evaporator facilitates the use and application of a monogroove heat pipe by providing an evaporation section which is compact in area and structurally more compatible with certain heat exchangers or heat input apparatus. The evaporation section of a monogroove heat pipe is formed by a series of parallel legs having a liquid and a vapor channel and a communicating capillary slot therebetween. The liquid and vapor channels and interconnecting capillary slots of the evaporating section are connected to the condensing section of the heat pipe by a manifold connecting liquid and vapor channels of the parallel

evaporation section legs with the corresponding liquid and vapor channels of the condensing section.
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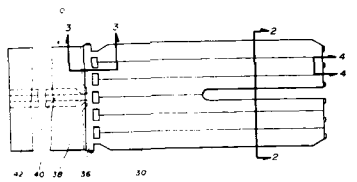
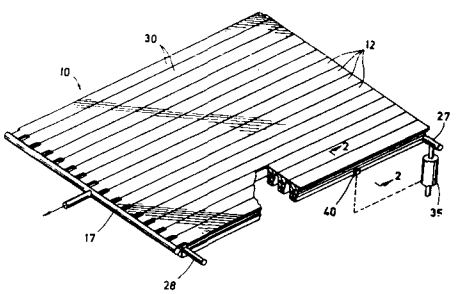
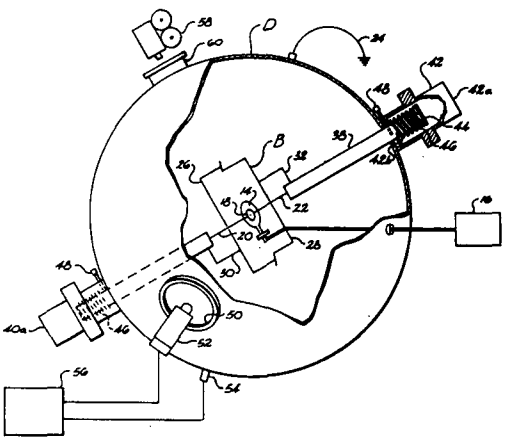


The electron bombardment furnace consists of two confinement grid sections which may be moved and separated from each other. Inside the bombardment furnace, a tungsten element is enclosed. The material specimen is located within the tungsten element and grounded by means of grounded support wires connected to the respective sections of the furnace. The material specimen is supported on the ground wires and heated by electron bombardment until melt occurs. The furnace sections are separated in opposite directions causing the ground wires to pull from the surfaces of the specimen, leaving the specimen freely suspended in the process chamber without the action of external forces. The specimen remains in its melt condition in the processing chamber where it can be undercooled without external forces acting on the specimen, which would cause dynamic nucleation. NASA

N86-32661*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MONOGROOVE COLD PLATE Patent Application
F. EDELSTEIN, inventor (to NASA) (Grumman Aerospace Corp., Bethpage, N.Y.) and R. F. BROWN, inventor (to NASA) 18 Jun. 1986 14 p Sponsored by NASA
(NASA-CASE-MSC-20946-1; US-PATENT-APPL-SN-875799; NAS 1.71:MSC-20946-1) Avail: NTIS HC A02/MF A01 CSCL 20D

The coolant fluid evaporated in a compact heat absorbing panel utilizing monogroove heat pipes in a pumped two-phase system is replenished through a liquid inlet control valve under the control of an ultrasonic liquid presence detector which is connected to the panel. The detector maintains the desired liquid quantity in the panel's liquid coolant channels, thereby dynamically responding to varying heat loads. NASA





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INSTRUMENTATION AND PHOTOGRAPHY

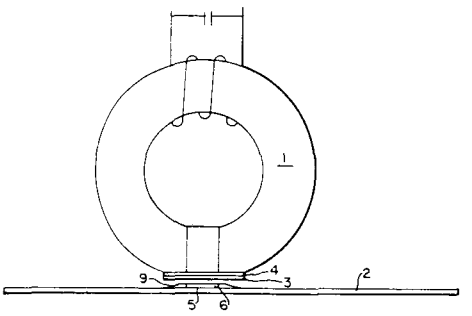
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

N86-23899*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPARATUS AND FURNACE FOR CONTAINERLESS PROCESSING OF HIGH TEMPERATURE MATERIALS IN SPACE Patent Application
M. B. ROBINSON and L. L. LACY, inventors (to NASA) 5 Dec. 1985 13 p
(NASA-CASE-MFS-28087-1; NAS 1.71:MFS-28087-1; US-PATENT-APPL-SN-805010) Avail: NTIS HC A02/MF A01 CSCL 14B

N86-24960*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INDUCTIVE ENERGY FOR RAPID STRAIN GUAGE ATTACHMENT Patent Application
T. D. SCHOTT, inventor (to NASA), R. L. FOX, inventor (to NASA), and J. D. BUCKLEY, inventor (to NASA) 20 Feb. 1986 11 p
(NASA-CASE-LAR-13237-1; NAS 1.71-LAR-13237-1; US-PATENT-APPL-SN-831372) Avail: NTIS HC A02/MF A01 CSCL 14B

A new method of bonding strain gauges to base structures was found. Induction heating is used to concentrate high temperature levels in the bonding of a strain gauge to a substrate. By using new method embodiments, the adhesive curing schedules of the prior art were reduced from a matter of hours to a matter of minutes. A method is provided for installing a strain gauge device on a base. According to another aspect of the present method invention, the layer of ferric material is a thin plate of ferric material which is placed substantially adjacent to the upper surface of the strain gauge device prior to the heating of the layer of ferric material by induction heating. By utilizing the separate plate of ferric material, the present invention may be utilized to

bond strain gauges to low reluctance bases such as aluminum or to no reluctance bases such as fiberglass. NASA



N86-25752* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

FLUID FLOW METER FOR MEASURING THE RATE OF FLUID FLOW IN A CONDUIT Patent

P. R. WHITE, inventor (to NASA) 25 Feb. 1986 8 p Filed 4 Apr. 1985 Supersedes N85-30286 Sponsored by NASA (NASA-CASE-MFS-28030-1; US-PATENT-4,572,004; US-PATENT-APPL-SN-719799; US-PATENT-CLASS-73-861.58) Avail: US Patent and Trademark Office CSCL 14B

A tube fluid flow rate meter consists of a reservoir divided by flexible diaphragm into two separate isolated compartments. The incoming and outgoing tubes open into the compartments. The orifice is sized to allow maximum tube fluid flow. Opposing compression springs are secured within the two compartments on opposite sides of the orifice to maintain orifice position when the tube fluid pressure is zero. A tapered element is centered in, and extends through the orifice into the compartment, leaving an annular opening between the element and the perimeter of the oriface. The size varies as the diaphragm flexes with changes in the tube fluid pressure to change the fluid flow through the opening. The light source directs light upon the element which in turn scatters the light through the opening into the compartment. The light detector in the compartment senses the scattered light to generate a signal indicating the amount of fluid.

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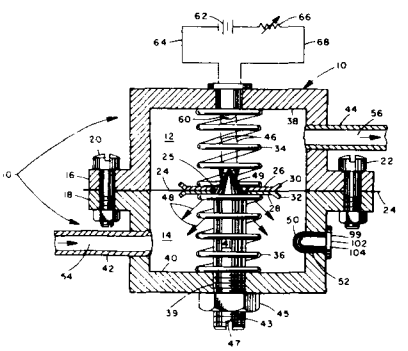

N86-25753* National Aeronautics and Space Administration. Pasadena Office, Calif.

DISCHARGE CELL FOR OPTOGALVANIC SPECTROSCOPY HAVING ORTHOGONAL RELATIONSHIP BETWEEN THE PROBE LASER AND DISCHARGE AXIS Patent

C. R. WEBSTER, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 29 Apr. 1986 12 p Filed 30 Nov. 1983 Sponsored by NASA (NASA-CASE-NPO-16271-1; US-PATENT-4,585,344; US-PATENT-APPL-SN-556514; US-PATENT-CLASS-356-311; US-PATENT-CLASS-356-318) Avail: US Patent and Trademark Office CSCL 14B

A method and apparatus for an optogalvanic spectroscopy system are disclosed. Orthogonal geometry exists between the axis of a laser probe beam and the axis of a discharge created by a pair of spaced apart and longituduinally aligned high voltage electrodes. The electrodes are movable to permit adjustment of the location of a point in the discharge which is to irradiated by a laser beam crossing the discharge region. The cell dimensions are selected so that the cross section of the discharge region is substantly comparable in size to the cross section of the laser beam passing orthogonally through the discharge region.

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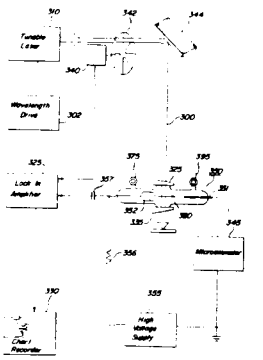

N86-26595* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SOLID SORBENT AIR SAMPLER Patent

T. J. GALEN, inventor (to NASA) (Northrop Services, Inc., Houston, Tex.) 29 Apr. 1986 7 p Supersedes N85-20301 Filed 10 Oct. 1984 Sponsored by NASA Sponsored by NASA (NASA-CASE-MSC-20653-1; US-PATENT-4,584,887; US-PATENT-APPL-SN-659474; US-PATENT-CLASS-73-863.31; US-PATENT-CLASS-73-863.21; US-PATENT-CLASS-73-864.34; US-PATENT-CLASS-73-863.72) Avail: US Patent and Trademark Office CSCL 14B

A fluid sampler for collecting a plurality of discrete samples over separate time intervals is described. The sampler comprises a sample assembly having an inlet and a plurality of discreet sample tubes each of which has inlet and outlet sides. A multiport dual acting valve is provided in the sampler in order to sequentially pass air from the sample inlet into the selected sample tubes. The sample tubes extend longitudinally of the housing and are located about the outer periphery thereof so that upon removal of an enclosure cover, they are readily accessible for operation of

the sampler in an analysis mode.
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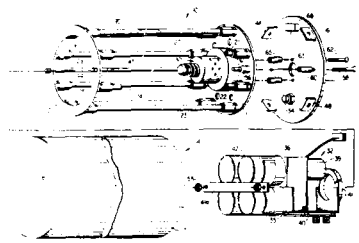
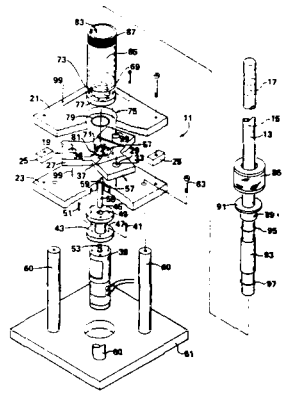


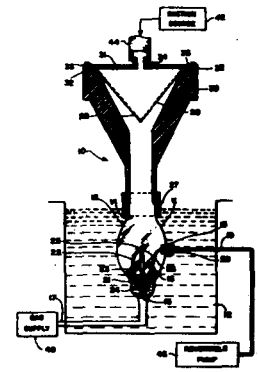
N86-26598*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PLANAR OSCILLATORY STIRRING APPARATUS Patent Application
M. F. WOLF, inventor (to NASA) (Stanford Univ., Calif.) 15 Aug. 1985 15 p
(Contract NAS8-34872)
(NASA-CASE-MFS-26002-1-CU; NAS 1.71:MFS-26002-1-CU; US-PATENT-APPL-SN-765991) Avail: NTIS HC A02/MF A01 CSCL 14B

The present invention is directed to an apparatus for stirring materials using planar orthogonal axes oscillations. The apparatus has a movable slide plate sandwiched between two fixed parallel support plates. Pressurized air is supplied to the movable slide plate which employs a tri-arm air bearing vent structure which allows the slide plate to float and to translate between the parallel support plates. The container having a material to be stirred is secured to the upper surface of the slide plate through an aperture in the upper support plate. A motor driven eccentric shaft loosely extends into a center hole bearing of the slide plate to cause the horizontal oscillations. Novelty lies in the combination of elements which exploits the discovery that low frequency, orthogonal oscillations applied horizontally to a Bridgman crucible provides a very rigorous stirring action, comparable with and more effective by an order of magnitude than the accelerated crucible rotation technique.
NASA



N86-29174* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NEBULIZATION REFLUX CONCENTRATOR Patent
V. G. COLLINS and W. R. COFER, III (College of William and Mary, Newport News, Va.) 17 Jun. 1986 6 p Filed 5 Nov. 1984 Supersedes N85-20154 (23 - 11, p 1615)
(NASA-CASE-LAR-13254-1CU; US-PATENT-4,595,399; US-PATENT-APPL-SN-668432; US-PATENT-CLASS-55-255; US-PATENT-CLASS-55-259; US-PATENT-CLASS-55-521; US-PATENT-CLASS-55-528; US-PATENT-CLASS-261-78A)
Avail: US Patent and Trademark Office CSCL 14B

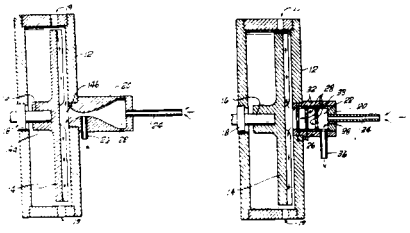
A nebulization reflux concentrator for removing trace gas contaminants from a sample gas is described. Sample gas from a gas supply is drawn by a suction source into a vessel. The gas enters the vessel through an atomizing nozzle, thereby atomizing and entraining a scrubbing liquid solvent drawn through a siphon tube from a scrubbing liquid reservoir. The gas and entrained liquid rise through a concentrator and impinge upon a solvent phobic filter, whereby purified gas exits through the filter housing and contaminated liquid coalesces on the solvent phobic filter and falls into the reservoir.
Official Gazette of the U.S. Patent and Trademark Office



N86-32695*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FLUIDIC ANGULAR VELOCITY SENSOR Patent
C. M. BERDAHL, inventor (to NASA) 29 Jul. 1986 9 p Filed 4 Apr. 1985 Supersedes N85-29219 (23 - 18, p 3104)
(NASA-CASE-NPO-16479-ICU; US-PATENT-4,602,509; US-PATENT-APPL-SN-719794; US-PATENT-CLASS-73-502; US-PATENT-CLASS-73-521) Avail: US Patent and Trademark Office CSCL 14B

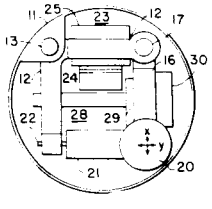
A fluidic sensor providing a differential pressure signal proportional to the angular velocity of a rotary input is described. In one embodiment the sensor includes a fluid pump having an impeller coupled to a rotary input. A housing forming a constricting fluid flow chamber is connected to the fluid input of the pump. The housing is provided with a fluid flow restrictive input to the flow chamber and a port communicating with the interior of the flow chamber. The differential pressure signal measured across the flow restrictive input is relatively noise free and proportional to the square of the angular velocity of the impeller. In an alternative embodiment, the flow chamber has a generally cylindrical configuration and plates having flow restrictive apertures are disposed within the chamber downstream from the housing port.

In this embodiment, the differential pressure signal is found to be approximately linear with the angular velocity of the impeller.
Official Gazette of the U.S. Patent and Trademark Office



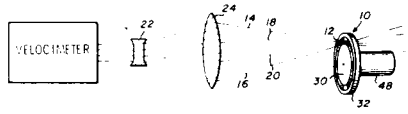
N86-32696* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TWO-AXIS, SELF-NULLING SKIN FRICTION BALANCE Patent
T. PING, inventor (to NASA) and F. H. SUPPLEE, JR., inventor (to NASA) 12 Aug. 1986 5 p Filed 28 Feb. 1985 Supersedes N85-21610 (23 - 12, p 1851)
(NASA-CASE-LAR-13294-1; US-PATENT-4,604,903; US-PATENT-APPL-SN-706681; US-PATENT-CLASS-73-862.04; US-PATENT-CLASS-73-147; US-PATENT-CLASS-73-862.61)
Avail: US Patent and Trademark Office CSCL 14B

A skin friction force measuring device is described which is comprised of a first pivoted L shaped arm, a second arm pivoted on one end of the L shaped arm with a sensing element attached to an end of the second arm. In response to skin friction forces on the sensing element the arms are pivoted about the two pivots and two nulling means force the pivots back to their zero position. The outputs of the two nulling means are indicative of the skin friction forces along two perpendicular axes in the plane of the sensing element.
Official Gazette of the U.S. Patent and Trademark Office



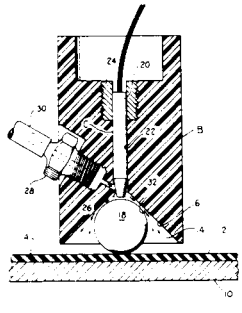
N86-32697* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPINNING DISK CALIBRATION METHOD AND APPARATUS FOR LASER DOPPLER VELOCIMETER Patent
P. K. SNYDER, inventor (to NASA) 15 Jul. 1986 8 p Filed 19 Apr. 1984 Supersedes N84-25015 (22 - 15, p 2335)
(NASA-CASE-ARC-11510-1; US-PATENT-4,600,301; US-PATENT-APPL-SN-602049; US-PATENT-CLASS-356-28.5; US-PATENT-CLASS-356-72; US-PATENT-CLASS-356-73; US-PATENT-CLASS-434-4; NAS 1.71:ARC-11510-1) Avail: US Patent and Trademark Office CSCL 14B

A method and apparatus for calibrating laser Doppler velocimeters having one or more intersecting beam pairs are described. These velocimeters measure fluid velocity by observing the light scattered by particles in the fluid stream. Moving fluid particulates are simulated by fine taut wires that are radially mounted on a disk that is rotated at a known velocity. The laser beam intersection locus is first aimed at the very center of the disk and then the disk is translated so that the locus is swept by the rotating wires. The radial distance traversed is precisely measured so that the velocity of the wires (pseudo particles) may be calculated.
NASA



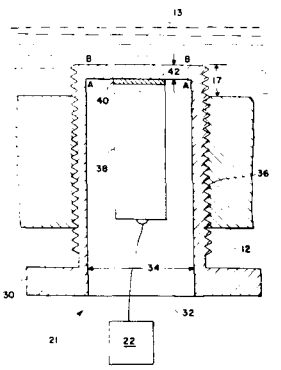
N86-32698* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPARATUS AND METHOD FOR INSPECTING A BEARING BALL Patent
B. F. BANKSTON, inventor (to NASA) 5 Nov. 1985 7 p Filed 09 Mar. 1983 Supersedes N83-21316 (21 - 11, p 1699)
(NASA-CASE-MFS-25833-1; US-PATENT-4,551,677; US-PATENT-APPL-SN-473827; US-PATENT-CLASS-324-226; US-PATENT-CLASS-324-238; US-PATENT-CLASS-324-240; US-PATENT-CLASS-324-262; US-PATENT-CLASS-73-37.5)
Avail: US Patent and Trademark Office CSCL 14B

A method and apparatus for inspecting the surface of a ball bearing is disclosed which includes a base having a high friction non-abrasive base scanning surface. A holding device includes a cone-shaped cup recess in which a ball element is received. Air is introduced through a passage to relieve friction between the wall of the recess and the ball element and facilitate rolling of the ball over the high friction base surface. The holding device is moved over the base scanning surface in a predetermined pattern such that the entire surface of the ball element is inspected byan eddy current probe which detects any surface defects.
Official Gazette of the U.S. Patent and Trademark Office



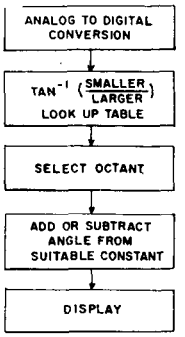
N86-32700*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ULTRASONIC DEPTH GAUGE FOR LIQUIDS UNDER HIGH PRESSURE Patent Application
A. J. ZUCKERWAR and D. S. MAZEL, inventors (to NASA) (Old Dominion Univ., Norfolk, Va.) 13 Feb. 1986 11 p
(NASA-CASE-LAR-13300-1CU; NAS 1.71:LAR-13300-CU; US-PATENT-APPL-SN-829042) Avail: NTIS HC A02/MF A01 CSCL 14B

The invention relates to an ultrasonic depth gauge for liquids under high pressure and is particularly useful in the space industry where it is necessary to use a pressurized gas to transfer a liquid from one location to another. Conventional liquid depth gauges do not have the capability to operate under extreme high pressures (i.e.: exceeding 300 p.s.i.). An ultrasonic depth gauge capable of withstanding high pressure according to the present invention is comprised of a transducer assembly and a supporting electronics unit. The transducer assembly is mounted into the bottom wall of a storage vessel with its resonating surface directly exposed to the highly pressurized liquid in the vessel. In operation, the ultrasonic pulse propagates upward through the liquid to the liquid-gas interface in the storage vessel. When the ultrasonic echo returns from the liquid-gas interface, it re-excites the composite resonator into vibration. The supporting electronics unit measures the round-trip transmit time for the ultrasonic pulse and its return echo to traverse the depth of the highly pressurized liquid. The novelty of this invention resides in the use of a conventional transducer rigidly bonded to the inside wall of a bored out conventional high-pressure plug to form a composite resonator capable of withstanding extremely high pressure. NASA



N86-32701*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IMPROVED FLUX-GATE MAGNETOMETER Patent Application
H. D. GARNER, inventor (to NASA) 16 Jul. 1986 16 p
(NASA-CASE-LAR-13560-1; US-PATENT-APPL-SN-886123; NAS 1.71:LAR-13560-1) Avail: NTIS HC A02/MF A01 CSCL 14B

The invention relates to a fluxgate magnetometer type device in which the directions and relative magnitudes of the components of the Earth's magnetic field, lying parallel to the longitudinal and to the transverse axes of the vehicle in which the device is mounted, are measured and used to calculate the heading of the vehicle with respect to magnetic north. The manner in which the components of the Earth's magnetic field are measured and the computing process used makes the device simple, inexpensive to manufacture and easy to calibrate. NASA



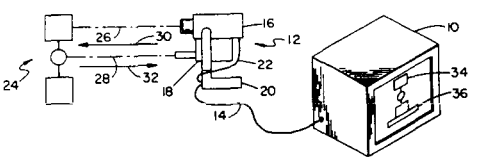
36

LASERS AND MASERS

Includes parametric amplifiers.

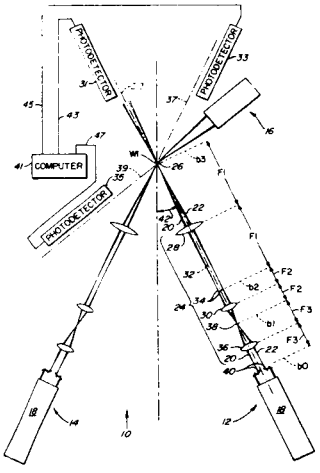
N86-24977*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LASER RANGING AND VIDEO DISPLAY SYSTEM Patent Application
J. K. RUSSELL, inventor to (NASA) (Lockheed Engineering and Management Services Co., Inc., Houston, Tex.) 18 Mar. 1986 23 p
(NASA-CASE-MSC-20870-1; NAS 1.71:MSC-20870-1; US-PATENT-APPL-SN-840825) Avail: NTIS HC A02/MF A01 CSCL 17I

Ranging data and video display systems, and, more particularly, methods and apparatus for generating measurements of range and range rate and display in conjunction with video imagery are developed. Method and apparatus are disclosed for deriving laser ranging information and generating a video display combining an image of the target with alpha-numeric indications of the ranging information. A television camera and laser ranger are boresighted parallel to one another and aimed at a remote target object. An infrared laser diode in the ranger is pulsed. Corresponding light pulses reflected from the target are detected by the ranger. Elapsed time between transmission of each of a plurality of such pulses and receipt by the ranger is measured and an average time derived. Processor circuitry derives ranges and range rate of the target from the time average, generates alpha-numeric indications, and superimposes them with target video images generated by the television camera on a television monitor. NASA



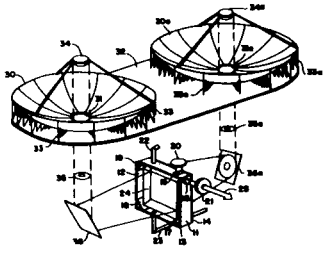
N86-24978*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DUAL MODE LASER VELOCIMETER Patent Application
W. D. GUNTER, JR., inventor (to NASA), R. W. DONALDSON, inventor (to NASA), and A. G. ANDERSON, JR., inventor (to NASA) 31 Mar. 1986 16 p
(NASA-CASE-ARC-11634-1; NAS 1.71:ARC-11634-1; US-PATENT-APPL-SN-846427) Avail: NTIS HC A02/MF A01 CSCL 20E

This invention relates to a laser Doppler velocimeter (LDV) that is capable of operating with a small focus diameter for analyzing fluid flows at low velocity with high spatial resolution, or with a larger focus diameter to measure fluid flows at higher velocities accurately. More particularly, it relates to such an LDV in which a simple reversal of a lens pair will allow the LDV to operate in the two focus diameter modes. NASA



N86-29204* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LONG GAIN LENGTH SOLAR PUMPED BOX LASER Patent
R. J. DEYOUNG 10 Jun. 1986 4 p Filed 18 Jun. 1985 Supersedes N86-19596 (24 - 10, p 1581)
(NASA-CASE-LAR-13256-1; US-PATENT-4,594,720; US-PATENT-APPL-SN-745973; US-PATENT-CLASS-372-79; NAS 1.71:LAR-13256-1) Avail: US Patent and Trademark Office CSCL 20E

A solar pumped laser has its lasing path lengthened by forming a square loop in the lasing path by means of bending mirrors. Solar radiation is collected and concentrated into a donut shaped intensity pattern. This intensity pattern is directed onto the lasing path such that there is a maximum fit of the solar intensity pattern to the square loop laser cavity.
Official Gazette of the U.S. Patent and Trademark Office



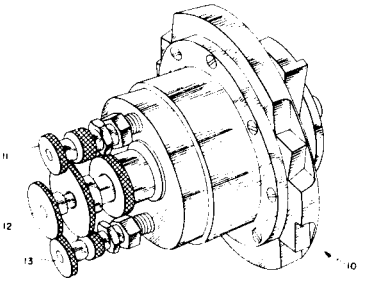
37

MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N86-24993*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ADJUSTABLE MOUNT FOR ELECTRO-OPTIC TRANSDUCERS IN AN EVACUATED CRYOGENIC SYSTEM Patent Application
E. A. CROSSLEY, JR., inventor (to NASA), D. P. HAYES, inventor (to NASA), H. C. JONES, inventor (to NASA), and I. W. JONES, inventor (to NASA) 20 Feb. 1986 16 p
(NASA-CASE-LAR-13100-1; NAS 1.71:LAR-13100-1; US-PATENT-APPL-SN-831377) Avail: NTIS HC A02/MF A01 CSCL 13I

The invention is a five-degree of freedom adjustable mounting device for positioning an electro-optic transducerr in an evacuated, cryogenic chamber. Electro-optic transducers are used in this manner as high sensitivity detectors of gas emission lines in spectroscopic analysis. The mount is made up of an adjusting mechanism and a transducer mount. This combination avoids many difficulties with prior devices by permitting the use of an internal lens and allowing independent adjustment of each degree of freedom. The transducer mount, although attached to the adjusting mechanism, is isolated thermally such that a cryogenic environment can be maintained at the transducer while the adjusting mechanism remains at room temperature. Radiation shields also are incorporated to further reduce heat flow to the transducer location. Features of this invention include the use of an internal lens and mechanizing of an adjustment device which allows for independent adjustments. An adjustment of one parameter will not affect the setting of any other parameter. This result is achieved by locating the centers of rotation of the angular adjustment at the focal point of the internal lens. NASA



N86-25789* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SYNCHRONOUSLY DEPLOYABLE TRUSS STRUCTURE Patent
H. G. BUSH, inventor (to NASA), M. MIKULAS, JR., inventor (to NASA), and E. WALLSOM, inventor (to NASA) (Kentron International, Inc., Hampton, Va.) 1 Apr. 1986 8 p Filed 30 Nov. 1983 Sponsored by NASA
(NASA-CASE-LAR-13117-1; US-PATENT-4,578,920; US-PATENT-APPL-SN-556512; US-PATENT-CLASS-52-645; US-PATENT-CLASS-52-111; US-PATENT-CLASS-52 648; US-PATENT-CLASS-244-159; US-PATENT-CLASS-244-173; US-PATENT-CLA S-343-881; US-PATENT-CLASS-343-882) Avail: US Patent and Trademark Office CSCL 13I

A collapsible-expandable truss structure, including first and second spaced surface truss layers having an attached core layer

is described. The surface truss layers are composed of a plurality of linear struts arranged in multiple triangular configurations. Each linear strut is hinged at the center and hinge connected at each end to a nodular joint. A passive spring serves as the expansion force to move the folded struts from a stowed collapsed position to a deployed operative final truss configuration. A damper controls the rate of spring expansion for the synchronized deployment of the truss as the folded configuration is released for deployment by the restrain belts. The truss is synchronously extended under the control of motor driven spools.

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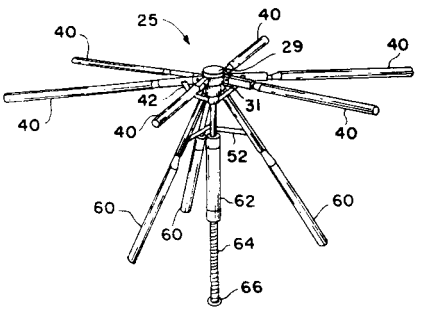

N86-25790* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

VARIABLE FRICTION SECONDARY SEAL FOR FACE SEALS Patent

E. DIRUSSO, inventor (to NASA) 8 Apr. 1986 5 p Filed 16 Nov. 1984 Supersedes N85-20377 Sponsored by NASA (NASA-CASE-LEW-14170-1; US-PATENT-4,580-791; US-PATENT-APPL-SN-672224; US-PATENT-CLASS-227-27; US-PATENT-CLASS-227-28) Avail: US Patent and Trademark Office CSCL 11A

Vibration and stability of a primary seal ring is controlled by a secondary seal system. An inflatable bladder which forms a portion of the secondary seal varies the damping applied to this seal ring. The amplitude of vibration of the primary seal ring is sensed with a proximity probe that is connected to a microprocessor in a control system. The bladder pressure is changed by the control system to mitigate any sensed instability or vibration.

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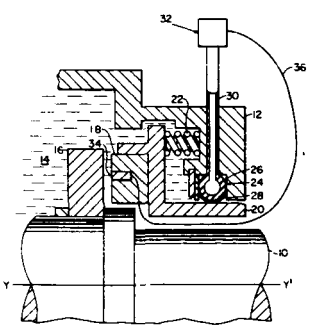

N86-25791* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

LATCHING MECHANISM FOR DEPLOYABLE/RE-STOWABLE COLUMNS USEFUL IN SATELLITE CONSTRUCTION Patent

E. L. AHL, JR., inventor (to NASA) 6 May 1986 11 p Filed 2 May 1984 Supersedes N84-25063 Sponsored by NASA (NASA-CASE-LAR-13169-1; US-PATENT-4,587,526; US-PATENT-APPL-SN-606431; US-PATENT-CLASS-343-883; US-PATENT-CLASS-343-DIG.2; US-PATENT-CLASS-52-110) Avail: US Patent and Trademark Office CSCL 13I

A column longeron latch assembly provides the securing mechanism for the deployable, telescoping column of a hoop/column antenna. The column is an open lattice structure with three longerons disposed 120 deg apart as the principle load bearing member. The column is deployed from a pair of eleven nested bays disposed on opposite sides of a center section under the influence of a motor-cable-pulley system. The longeron latch is a four bar linkage mechanism using the over-center principle for automatically locking the longeron sections into position during deployment. The latch is unlocked when the antenna is to be restowed. A spring pack disposed in the end of each longeron serves to absorb stress forces on the deployed column through the cam head piston and abutting latch from an adjacent longeron.

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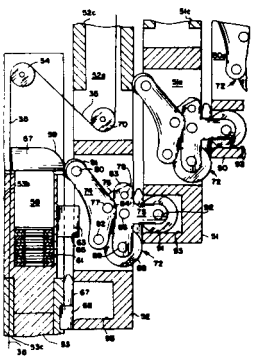

N86-27629* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

LOAD POSITIONING SYSTEM WITH GRAVITY COMPENSATION Patent

R. H. HOLLOW 12 Dec. 1984 9 p (NASA-CASE-ARC-11525-1; US-PATENT-4,591,772; US-PATENT-APPL-SN-681041; US-PATENT-CLASS-318-632; US-PATENT-CLASS-318-8; US-PATENT-CLASS-318-48; US-PATENT-CLASS-318-663) Avail: US Patent and Trademark Office CSCL 13I

A load positioning system with gravity compensation has a servomotor, position sensing feedback potentiometer and velocity sensing tachometer in a conventional closed loop servo arrangement to cause a lead screw and a ball nut to vertically position a load. Gravity compensating components comprise the DC motor, gears, which couple torque from the motor to the lead screw, and constant current power supply. The constant weight of the load applied to the lead screw via the ball nut tend to cause the lead screw to rotate, the constant torque of which is opposed by the constant torque produced by the motor when fed from the constant current source. The constant current is preset as required by the potentiometer to effect equilibration of the load which thereby enables the positioning servomotor to see the load

as weightless under both static and dynamic conditions. Positioning acceleration and velocity performance are therefore symmetrical.
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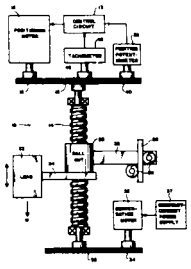
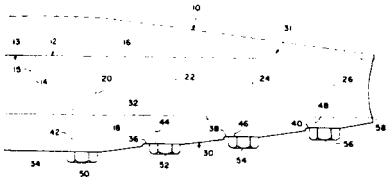


N86-27630* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OPTIMIZED BOLTED JOINT Patent
L. J. HART-SMITH (McDonnell-Douglas Corp., Long Beach, Calif.), B. L. BUNIN, and D. J. WATTS, inventors (to NASA) 1 Apr. 1986 9 p Filed 23 Jan. 1984 Supersedes N84-20859 (22 - 11, p 1664) Sponsored by NASA. Langley Research Center
(NASA-CASE-LAR-13250-1; US-PATENT-4,579,475;
US-PATENT-APPL-SN-573162; US-PATENT-CLASS-403-312;
US-PATENT-CLASS-403-388; US-PATENT-CLASS-403-408.1)
Avail: US Patent and Trademark Office CSCL 13I

A method is disclosed for joining segments of the skin of an aircraft. The ends of the skin are positioned in close proximity or abutt each other. The skin is of constant thickness throughout the joint and is sandwiched between splice plates, which taper in thickness from the last to the first bolt rows in order to reduce the stiffness of the splice plate and thereby reduce the load transfer at the location where bypass loads are the highest.
Official Gazette of the U.S. Patent and Trademark Office



N86-32736*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD OF REPAIRING HIDDEN LEAKS IN TUBES Patent
J. D. DUESBERG, inventor (to NASA) and R. C. MILLS, SR., inventor (to NASA) 12 Aug. 1986 5 p Filed 30 Aug. 1985 Supersedes N86-20802 (24 - 11, p 1783)
(NASA-CASE-MFS-19796-1; US-PATENT-4,605,155;
US-PATENT-APPL-SN-770920; US-PATENT-CLASS-228-119;
US-PATENT-CLASS-138-97; US-PATENT-CLASS-165-76;
US-PATENT-CLASS-29-402.16) Avail: US Patent and Trademark Office CSCL 13I

A method of repairing a tubular assembly in which access to a defect in the tube is limited includes the steps of cutting an opening in the tube on the side opposite the defect so as to expose the defect from the inside of the tube. A tubular insert is inserted into the tube to cover the defect and is secured in place by means of brazing or welding. The remaining space between the opening and insert is closed by means of close-out patches which are welded or brazed to both the insert and the tube. The result is a permanent repair having great structural integrity.
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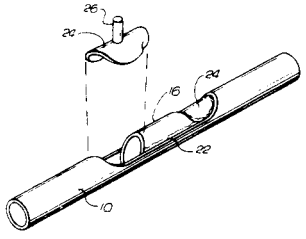
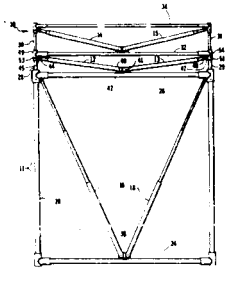


N86-32737* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEPLOYABLE M-BRACED TRUSS STRUCTURE Patent
M. M. MIKULAS, JR., inventor (to NASA) and M. D. RHODES, inventor (to NASA) 12 Aug. 1986 8 p Filed 30 Jul. 1985 Supersedes N86-20799 (24 - 11, p 1783)
(NASA-CASE-LAR-13081-1; US-PATENT-4,604,844;
US-PATENT-APPL-SN-760378; US-PATENT-CLASS-52-632;
US-PATENT-CLASS-52-111; US-PATENT-CLASS-52-645;
US-PATENT-CLASS-52-646) Avail: US Patent and Trademark Office CSCL 13I

A deployable M-braced truss structure, efficiently packaged into a compact stowed position and expandable to an operative position at the use site is described. The M-braced configuration effectively separates tension compression and shear in the structure and permits efficient structural design. Both diagonals and longerons telescope from an M-braced base unit and deploy either pneumatically, mechanically by springs or cables, or by powered reciprocating mechanisms. Upon full deployment, the diagonals and longerons lock into place with a simple latch mechanism.
Official Gazette of the U.S. Patent and Trademark Office

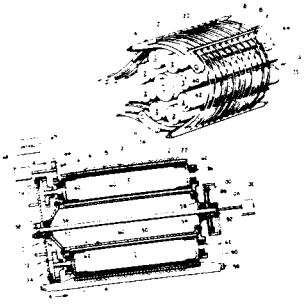


N86-32738* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REMOTELY OPERABLE PERISTALTIC PUMP Patent
R. R. BELEW, inventor (to NASA) 5 Aug. 1986 11 p Filed 08 Mar. 1985 Supersedes N85-29288 (23 - 18, p 3116)
(NASA-CASE-MFS-28059-1; US-PATENT-4,604,038;
US-PATENT-APPL-SN-709255; US-PATENT-CLASS-417-475)
Avail: US Patent and Trademark Office CSCL 13K

A peristaltic pump is disclosed which includes a roller assembly on which is mounted a series of pump rollers. As the roller assembly is rotated by a drive gear the pump rollers are driven in reverse

rotation by means of a stationary ring gear and pump roller gears. An upper pressure shoe plate and a lower pressure shoe plate are positioned above sets of flexible tubing. The tubing is sandwiched between the pressure shoe plates and the pump rollers. A highly compact pump is provided having twice as many fluid channel lines as is conventional. The peristaltic pump device may be remotely operated by means of a rotary actuator which rotates a driving hub to move the shoe plates by means of eccentrically mounted links. The pressure shoe plates may be moved by the rotary actuator to a loaded position in which the fluid lines are pinched by the pump rollers and fluid is pumped to an unloaded position in which the fluid lines are maintained in an undeformed, uncrimped configuration so that no creases or crimps are set into the fluid lines during periods of prolonged nonuse.

Official Gazette of the U.S. Patent and Trademark Office

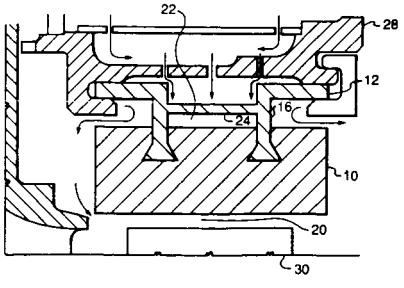


N86-32740*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMAL STRESS MINIMIZED, TWO COMPONENT, TURBINE SHROUD SEAL Patent Application

R. F. HANDSCHUH, inventor (to NASA) 18 Jun. 1986 17 p (NASA-CASE-LEW-14212-1; US-PATENT-APPL-SN-875798; NAS 1.71:LEW-14212-1) Avail: NTIS HC A02/MF A01 CSCL 11A

In a turbine machine, a two component shroud seal which maximizes insulation and sealing around the rotating turbine blades and made by independently fabricating each of the two components then joining them together is disclosed. The two components may be joined together at room temperature. The resulting shroud seal provides greater engine efficiency and thrust. NASA



39

STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

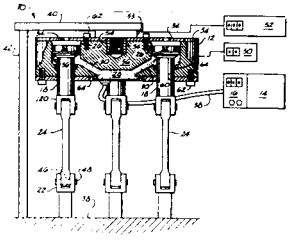
N86-32770*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

FATIGUE TESTING A PLURALITY OF TEST SPECIMENS AND METHOD Patent Application

J. D. HODO, inventor (to NASA), D. R. MOORE, inventor (to NASA), T. F. MORRIS, inventor (to NASA), and N. G. TILLER, inventor (to NASA) 16 Jul. 1986 12 p (NASA-CASE-MFS-28118-1; US-PATENT-APPL-SN-886121; NAS 1.71:MFS-28118-1) Avail: NTIS HC A02/MF A01 CSCL 20K

This invention relates to a fatigue testing apparatus for simultaneously subjecting a plurality of material test specimens to cyclical tension loading to determine the fatigue strength of the material. The fatigue testing apparatus includes a pulling head having cylinders defined therein which carry reciprocating pistons. The reciprocation of the pistons is determined by cyclical supplies of pressurized fluid to the cylinders. Piston rods extend from the pistons through the pulling head and are attachable to one end of test specimens, the other end of the test specimens being attachable to a fixed base, causing test specimens attached between the piston rods and the base to be subjected to cyclical tension loading. Because all of the cylinders share a common pressurized fluid supply, the breaking of a test specimen does not substantially effect the pressure of the fluid supplied to the other cylinders nor the tension applied to the other test specimens.

NASA



44

ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

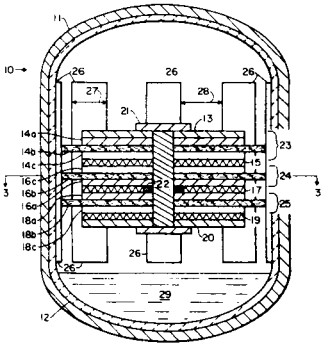
N86-25874* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OXYGEN RECOMBINATION IN INDIVIDUAL PRESSURE VESSEL NICKEL-HYDROGEN BATTERIES Patent

J. J. SMITHRICK, inventor (to NASA) 22 Apr. 1986 6 p Filed 27 Jun. 1984 Supersedes N84-29084 Sponsored by NASA (NASA-CASE-LEW-13822-1; US-PATENT-4,584,249; US-PATENT-APPL-SN-625077; US-PATENT-CLASS-429-57; US-PATENT-CLASS-429-27; US-PATENT-CLASS-42-101) Avail: US Patent and Trademark Office CSCL 10C

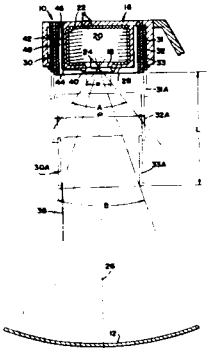
A metal-hydrogen cell is described which avoids damage and retards flooding of the hydrogen electrodes by providing for

chemical recombination of oxygen and hydrogen in areas or sites remote from the hydrogen electrodes. In the metal-hydrogen cell, a plurality of electrical cell units are place in a back to back relationship. The cells may be lined with a wick, having one or more catalyzed sites on the inner surface of the cell. Separators disposed between the respective metal and hydrogen electrodes of each cell unit are provided with gas directing notches around their peripheries to facilitate the desired movement of gasses within the metal-hydrogen cell. Any two metal electrodes separated by a gas screen are provided with gas tight sealing means between the electrodes at each aperature. The sealing means may be a fing of rubber or elastomeric material which is somewhat compressible but nonreactive with other materials in the cell.
Official Gazette of the U.S. Patent and Trademark Office



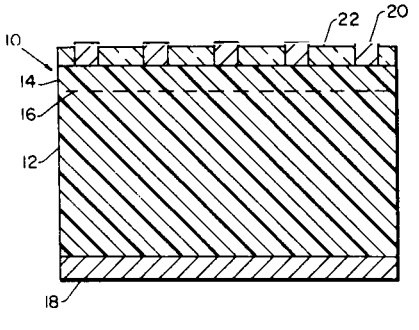
N86-27706* National Aeronautics and Space Administration. Pasadena Office, Calif.
PROTECTIVE TELESCOPING SHIELD FOR SOLAR CONCENTRATOR Patent
M. J. ARGOUD (Jet Propulsion Lab., California Inst. of Tech., Pasadena), W. L. WALKER, and L. V. BUTLER, inventors (to NASA) 6 May 1986 7 p Filed 22 Feb. 1984 Supersedes N84-25164 (22 - 15, p 2361) Sponsored by NASA. Pasadena Office
(NASA-CASE-NPO-16236-1; US-PATENT-4,586,487; US-PATENT-APPL-SN-582495; US-PATENT-CLASS-126-418; US-PATENT-CLASS-126-419; US-PATENT-CLASS-126-438)
Avail: US Patent and Trademark Office CSCL 10A

An apparatus is described for use with a solar concentrator such as a parabolic dish which concentrates sunlight onto a small opening of a solar receiver, for protecting the receiver in the event of a system failure that could cause concentrated sunlight to damage the receiver. The protective apparatus includes a structure which can be moved to a stowed position where it does not block sunlight, to a deployed position. In this position, the structure forms a tube which substantially completely surrounds an axis connecting the receiver opening to the center of the concentrator at locations between the receiver and the concentrator.
Official Gazette of the U.S. Patent and Trademark Office



N86-32875* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LITHIUM COUNTERDOPED SILICON SOLAR CELL Patent
I. WEINBERG, inventor (to NASA) and H. W. BRANDHORST, JR., inventor (to NASA) 26 Aug. 1986 7 p Filed 07 Nov. 1984 Supersedes N85-20535 (23 - 11, p 1672)
(NASA-CASE-LEW-14177-1; US-PATENT-4,608,452; US-PATENT-APPL-SN-669140; US-PATENT-CLASS-136-261; US-PATENT-CLASS-29-572; US-PATENT-CLASS-29-576B; US-PATENT-CLASS-148-1.5; US-PATENT-CLASS-357-30; US-PATENT-CLASS-357-91) Avail: US Patent and Trademark Office CSCL 10A

The resistance to radiation damage of an n(+)p boron doped silicon solar cell is improved by lithium counterdoping. Even though lithium is an n-dopant in silicon, the lithium is introduced in small enough quantities so that the cell base remains p-type. The lithium is introduced into the solar cell wafer by implantation of lithium ions whose energy is about 50 keV. After this lithium implantation, the wafer is annealed in a nitrogen atmosphere at 375 C for two hours. Official Gazette of the U.S. Patent and Trademark Office



54

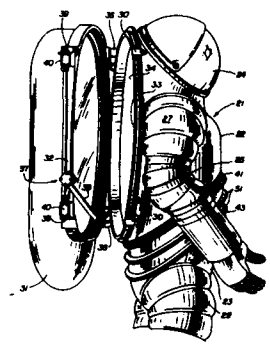
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N86-28618* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TORSO SIZING RING CONSTRUCTION FOR HARD SPACE SUIT Patent
H. C. VYKUKAL 10 Jun. 1986 9 p Filed 20 Dec. 1984 Supersedes N85-21987 (23 - 12, p 1910)
(NASA-CASE-ARC-11616-1; US-PATENT-4,593,415; US-PATENT-APPL-SN-684193; US-PATENT-CLASS-2-2.1A; US-PATENT-CLASS-2-2.1R; US-PATENT-CLASS-128-202.11; US-PATENT-CLASS-414-1; US-PATENT-CLASS-414-5; US-PATENT-CLASS-414-7; US-PATENT-CLASS-414-8) Avail: US Patent and Trademark Office CSCL 06Q

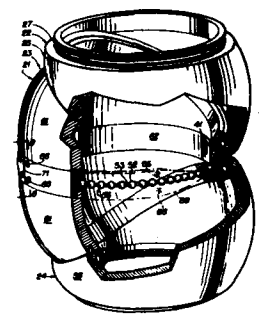
A hard suit for use in space or diving applications having an adjustable length torso covering that will fit a large variety of wearers is described. The torso covering comprises an upper section and a lower section which interconnect so that the covering will fit wearers with short torsos. One or more sizing rings may be inserted between the upper and lower sections to accomodate larger torso sizes as required. Since access of the astronaut to the torso covering is preferably through an opening in the back of the upper section (which is closed off by the backpack), the rings slant upward-forward from the lower edge of the opening. The lower edge of the upper covering section has a coupler which slants upward-forward from the lower edge of the back opening. The lower torso section has a similarly slanted coupler which may interfit with the upper section coupler to accomodate the smallest torso size. One or more sizing rings may be inserted between the coupler sections of the upper and lower torso sections to accomodate larger torsos. Each ring has an upper coupler which may interfit with the upper section coupler and a lower coupler which may interfit with the lower section coupler.

Official Gazette of the U.S. Patent and Trademark Office



N86-28619* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ELBOW AND KNEE JOINT FOR HARD SPACE SUITS Patent
H. C. VYKUKAL 8 Jul. 1986 13 p Filed 30 Dec. 1984 Supersedes N85-20666 (23 - 11, p 1697)
(NASA-CASE-ARC-11610-1; US-PATENT-4,598,427; US-PATENT-APPL-SN-684190; US-PATENT-CLASS-2-2.1A; US-PATENT-CLASS-2-2.1R; US-PATENT-CLASS-285-168; US-PATENT-CLASS-138-120) Avail: US Patent and Trademark Office CSCL 06Q

An elbow or knee joint for a hard space suit or similar usage is formed of three serially connected rigid sections which have truncated spherical configurations. The ends of each section form solid geometric angles, and the sections are interconnected by hermetically sealed ball bearings. The outer two sections are fixed together for rotation in a direction opposite to rotation of the center section. A preferred means to make the outer sections track each other in rotation comprises a rotatable continuous bead chain which engages sockets circumferentially spaced on the facing sides of the outer races of the bearings. The joint has a single pivot point and the bearing axes are always contained in a single plane for any articulation of the joint. Thus flexure of the joint simulates the coplanar flexure of the knee or elbow and is not susceptible to lockup. Official Gazette of the U.S. Patent and Trademark Office



N86-28620* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SHOULDER AND HIP JOINT FOR HARD SPACE SUITS Patent
H. C. VYKUKAL 17 Jun. 1986 11 p Filed 20 Dec. 1984 Supersedes N85-21986 (23 - 12, p 1910)
(NASA-CASE-ARC-11543-1; US-PATENT-4,594,734; US-PATENT-APPL-SN-684192; US-PATENT-CLASS-2-2.1A; US-PATENT-CLASS-414-7; US-PATENT-CLASS-285-168; US-PATENT-CLASS-138-120) Avail: US Patent and Trademark Office CSCL 06Q

Shoulder and hip joints for hard space suits are disclosed which are comprised of three serially connected truncated spherical sections, the ends of which converge. Ball bearings between the sections permit relative rotation. The proximal end of the first section is connected to the torso covering by a ball bearing and the distal end of the outermost section is connected to the elbow or thigh covering by a ball bearing. The sections are equi-angular and this alleviates lockup, the condition where the distal end of the joint leaves the plane in which the user is attempting to flex. The axes of rotation of the bearings and the bearing mid planes are arranged to intersect in a particular manner that provides the joint with a minimum envelope. In one embodiment, the races of the bearing between the innermost section and the second section

is partially within the inner race of the bearing between the torso and the innermost spherical section further to reduce bulk.

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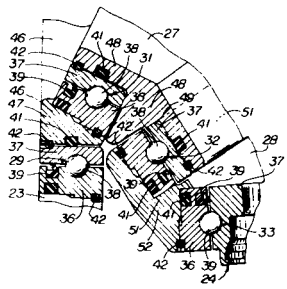

N86-29507*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SHOULDER AND HIP JOINTS FOR HARD SPACE SUITS AND THE LIKE Patent

H. C. VYKUKAL 8 Jul. 1986 12 p Filed 20 Aug. 1984 Supersedes N84-33021 (22 - 22, p 3633)
(NASA-CASE-ARC-11534-1; US-PATENT-4,598,428; US-PATENT-APPL-SN-642602; US-PATENT-CLASS-2-2.1A; US-PATENT-CLASS-285-168; US-PATENT-CLASS-285-184; US-PATENT-CLASS-285-227; US-PATENT-CLASS-138-120; US-PATENT-403-164) Avail: US Patent and Trademark Office CSCL 06Q

For use in hard space suits and the like, a joint between the torso covering and the upper arm covering (i.e., shoulder) or between the torso covering and upper leg covering (i.e., hip) is disclosed. Each joint has an outer covering and a inner covering. The outer covering has plural perferably truncated toroidal sections decreasing in size proceeding outwardly. In one embodiment at each joint there are two bearings, the first larger than the second. The outer race of the larger bearing is attached to the outer edge of the smaller end of each section and the inner race of the larger bearing is attached to the end wall. The inner race of the smaller bearing is attached to the end wall. The outer race of the smaller bearing is attached to the larger end of the next section. Each bearing hask appropriate seals. Between each section is a rubber ring for the comfort of the wearer. Such rubber rings have radial flanges attached to the inner races of two adjacent bearings. Matching semicircular grooves are formed in the abutting overlapping surfaces. Bellows-like inner walls are also provided for each section fixed at one end to an inner cylindrical flange and, at the opposite end, to an end wall. Each outer section may rotate 360 deg relative to the next outer section, whereas the bellows sections do not rotate, but rather expand or contract locally as the rigid sections rotate relative to each other.

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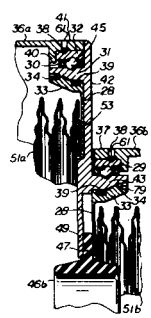


60

COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

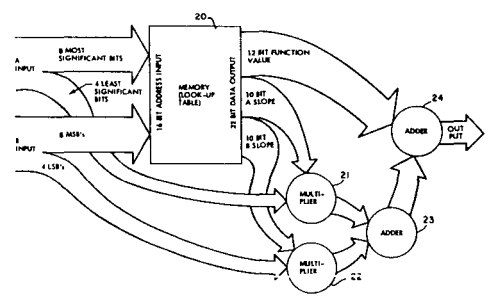
N86-23283*# National Aeronautics and Space Administration. Pasadena Office, Calif.

PROGRAMMABLE PIPELINED IMAGE PROCESSOR Patent Application

D. B. GENNERY and B. WILCOX, inventors (to NASA) 31 Dec. 1985 31 p
(Contract NAS7-918)
(NASA-CASE-NPO-16461-1CU; NAS 1.71:NPO-16461-1CU; US-PATENT-APPL-SN-815103) Avail: NTIS HC A03/MF A01 CSCL 09B

A pipelined image processor selectively interconnects modules in a column of a two dimensional array to modules of the next column of the array of modules 1,1 through M,N, where M is the number of modules in one dimension and N is the number of modules in the other direction. Each module includes two input selectors for A and B inputs, two convolvers, a binary function operator, a neighborhood comparison operator which produces an A output and an output selector which may select as a B output the output of any one of the components in the module, including the A output of the neighborhood comparison operator. Each module may be connected to as many as eight modules in the next column, preferably with the majority always in a different row that is up (or down) in the array for a generally spiral data path around the torus thus formed. The binary function operator is implemented as a look-up table addressed by the most significant 8 bits of each 12-bit argument. The table output includes a function a function value and the slopes for interpolation of the two arguments by multiplying the 4 least significant bits in multipliers and adding the products to the function value through adders.

NASA

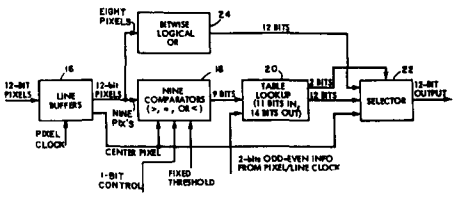


N86-24224*# National Aeronautics and Space Administration. Pasadena Office, Calif.

NEIGHBORHOOD COMPARISON OPERATOR Patent Application

D. B. GENNERY, inventor (to NASA) (JPL, Pasadena, Calif.) 31 Dec. 1985 13 p
(Contract NAS7-918)
(NASA-CASE-NPO-16464-1CU; NAS 1.71:NPO-16464-1CU; US-PATENT-APPL-SN-815099) Avail: NTIS HC A02/MF A01 CSCL 09B

Digital values in a moving window are compared by an operator having nine comparators connected to line buffers for receiving a succession of central pixels together with eight neighborhood pixels. A single bit of program control determines whether the neighborhood pixels are to be compared with the central pixel or a threshold value. The central pixel is always compared with the threshold. The omparator output plus 2 bits indicating odd-even pixel/line information about the central pixel addresses a lookup table to provide 14 bits of information, including 2 bits which control a selector to pass either the central pixel value, the other 12 bits of table information, or the bit-wise logical OR of all nine pixels through circuit that implements a very wide OR gate. NASA



N86-24225*# National Aeronautics and Space Administration. Pasadena Office, Calif.

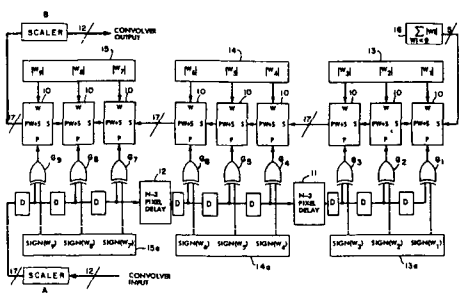
CONVOLVER Patent Application

B. WILCOX, inventor (to NASA) (JPL, Pasadena, Calif.) 31 Dec. 1985 14 p

(Contract NAS7-918)

(NASA-CASE-NPO-16462-1CU; NAS 1.71:NPO-16462-1CU; US-PATENT-APPL-SN-815106) Avail: NTIS HC A02/MF A01 CSCL 09B

A 3-by-3 convolver utilizes 9 binary arithmetic units connected in cascade for multiplying 12-bit binary pixel values P sub i which are positive or two's complement negative binary numbers by 5-bit magnitude (plus sign) weights W sub i which may be positive or negative. The weights are stored in registers including the sign bits. For a negative weight, the one's complement of the pixel value to be multiplied is formed at each unit by a bank of 17 exclusive or gates G sub i under control of the sign of the corresponding weight w sub i, and a correction is made by adding the sum of the absolute values of all the negative weights for each 3x3 kernel. Since this correction value remains constant as long as the weights are constant, it can be precomputed and stored in a register as a value to be added to the product PW of the first arithmetic unit. NASA



72

ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

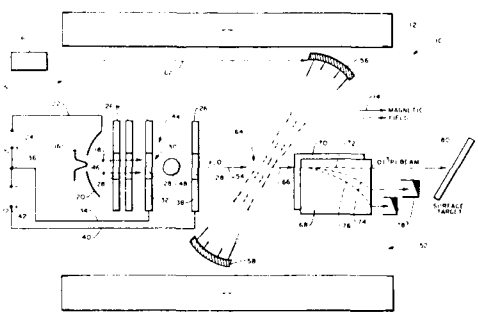
N86-27055*# National Aeronautics and Space Administration. Pasadena Office, Calif.

VARIABLE ENERGY, HIGH FLUX, GROUND-STATE ATOMIC OXYGEN SOURCE Patent Application

A. CHUTJIAN, Inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and O. J. ORIENT, Inventor (to NASA) 10 Apr. 1986 17 p Sponsored by NASA

(NASA-CASE-NPO-16640-1-CU; NAS 1.71:NPO-16640-1-CU; US-PATENT-APPL-SN-852468) Avail: NTIS HC A02/MF A01 CSCL 20H

A variable energy, high flux atomic oxygen source is described which is comprised of a means for producing a high density beam of molecules which will emit O(-) ions when bombarded with electrons; a means for producing a high current stream of electrons at a low energy level passing through the high density beam of molecules to produce a combined stream of electrons and O(-) ions; a means for accelerating the combined stream to a desired energy level; a means for producing an intense magnetic field to confine the electrons and O(-) ions; a means for directing a multiple pass laser beam through the combined stream to strip off the excess electrons from a plurality of the O(-) ions to produce ground-state O atoms within the combined stream; an electrostatic deflection means for deflecting the path of the O(-) ions and the electrons in the combined stream; and a means for stopping the O(-) ions and the electrons and for allowing only the ground-state O atoms to continue as the source of the atoms of interest. The method and apparatus are also adaptable for producing other ground-state atoms and/or molecules. NASA



N86-33127* National Aeronautics and Space Administration. Pasadena Office, Calif.

DOUBLE PHOTON EXCITATION OF HIGH-RYDBERG ATOMS AS A LONG-LIVED SUBMILLIMETER DETECTOR Patent

A. N. CHUTJIAN, inventor (to NASA) 15 Jul. 1986 8 p Filed 21 Feb. 1985 Supersedes N85-30779 (23 - 19, p 3352)

(NASA-CASE-NPO-16372-1; US-PATENT-4,600,840; US-PATENT-APPL-SN-703847; US-PATENT-CLASS-250-338; US-PATENT-CLASS-250-336.1; US-PATENT-CLASS-250-340) Avail: US Patent and Trademark Office CSCL 20H

A method and apparatus for detecting submillimeter or IR radiation is disclosed. A rare gas, such as xenon, is supplied at

its ground state via a pressurized cylinder and an adjustable leak valve into a cryogenically cooled detection area. The ground state of xenon is double photon excited to a particularized level of the Rydberg series by a resonance lamp and a laser. The doubly excited gas is then further excited by the radiation to be measured. A field ionization and an ion measurement indicative of the radiation intensity is achieved.

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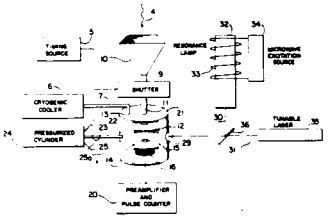

74

OPTICS

Includes light phenomena.

N86-26190* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OPTICAL MULTIPLE SAMPLE VACUUM INTEGRATING SPHERE Patent

C. L. BUTNER, inventor (to NASA) 22 Apr. 1986 6 p Filed 30 Nov. 1983 Supersedes N84-15960 Sponsored by NASA (NASA-CASE-GSC-12849-1; US-PATENT-4,583,860; US-PATENT-APPL-SN-556481; US-PATENT-CLASS-356-446; US-PATENT-CLASS-250-228; US-PATENT-CLASS-56-73; US-PATENT-CLASS-356-236; US-PATENT-CLASS-356-244) Avail: US Patent and Trademark Office CSCL 20F

An integrating sphere comprised of a uniform difusely reflecting spherical cavity, having mutually transverse input and output ports, and a linear sample transport mechanism is described. The sample transport mechanism is secured so that the multiple samples can be brought into registration with the input port, one at a time, without having to open or disassemble the apparatus when a change of sample is desired. A vacuum tight seal is provided between the cavity and the transport mechanism. This maintains the integrity of a vacuum generated with the sphere when attached to the source of optical energy. The device is utilized to test emissive characteristics such as the relative fluorescence quantum efficiency of a dye sample placed in the path of a monochromatic optical energy source coupled to the input port while having a light detector coupled to the output port.

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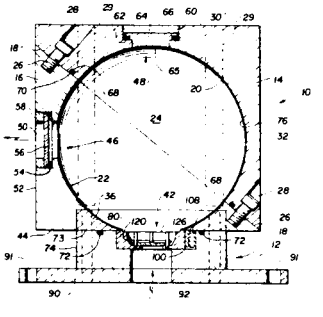

N86-28732* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

WIDE-ANGLE FLAT FIELD TELESCOPE Patent

K. L. HALLAM, B. J. HOWELL, and M. E. WILSON 8 Jul. 1986 7 p Filed 5 Feb 1985 Supersedes N85-20868 (23 - 11, p 1728) (NASA-CASE-GSC-12825-1; US-PATENT-4,598,981; US-PATENT-APPL-SN-698641; US-PATENT-CLASS-350-505; US-PATENT-CLASS-350-276R; US-PATENT-CLASS-354-479; US-PATENT-CLASS-358-222) Avail: US Patent and Trademark Office CSCL 20F

Described is an unobscured three mirror wide angle telescopic imaging system comprised of an input baffle which provides a 20 deg (Y axis) x 30 deg (X axis) field of view, a primary mirror having a convex spherical surface, a secondary mirror having a concave ellipsoidal reflecting surface, a tertiary mirror having a concave spherical reflecting surface. The mirrors comprise mirror elements which are offset segments of parent mirrors whose axes and vertices commonly lie on the system's optical axis. An iris diaphragm forming an aperture stop is located between the secondary and tertiary mirror with its center also being coincident with the optical axis and being further located at the beam waist of input light beams reflected from the primary and secondary mirror surfaces. At the system focus following the tertiary mirror is located a flat detector which may be, for example, a TV imaging tube or a photographic film. When desirable, a spectral transmission filter is placed in front of the detector in close proximity thereto.

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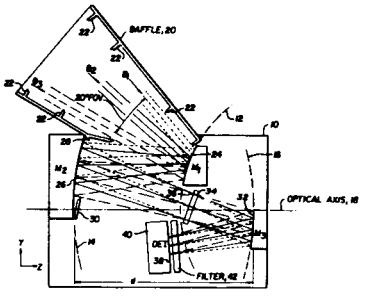


N86-29650*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

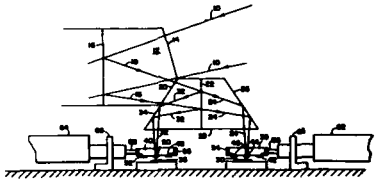
MULTISPECTRAL LINEAR ARRAY MULTIBAND SELECTION DEVICE Patent

H. L. RICHARD 8 Jul. 1986 8 p Filed 2 May 1984 Supersedes N84-25016 (22 - 15, p 2335) (NASA-CASE-GSC-12911-1; US-PATENT-4,599,001; US-PATENT-APPL-SN-606426; US-PATENT-CLASS-356-419; US-PATENT-CLASS-356-402; US-PATENT-CLASS-350-315; US-PATENT-CLASS-350-318) Avail: US Patent and Trademark Office CSCL 20F

An apparatus for detecting multiple spectral bands, individually or concurrently, using linear detector arrays is described. The system employs a beamsplitter to divide the optical source into two or more optical beams which are directed at the linear detector arrays. Filter trays are positioned in the focal planes of the optical beams so that the beams pass through the filter trays prior to impinging upon the detector arrays. Multiple filters are placed on the filter trays. Linear actuators positioned adjacent the filter trays translate the trays across the focal planes of the optical beams so that individual filters are positioned in the path of beams such that those frequencies of the beams that fall within the spectral ranges of the individual bandpass filter through which it passes

may be detected by the detector arrays for further examination and analysis.

Official Gazette of the U.S. Patent and Trademark Office



N86-32266* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OPTICAL DISTANCE MEASURING INSTRUMENT

J. B. ABSHIRE, inventor (to NASA) 15 Jul. 1986 10 p Filed 10 Aug. 1982 Supersedes N83-13982 (21 - 04, p 600) (NASA-CASE-GSC-12761-1; US-PATENT-4,600,299; US-PATENT-APPL-SN-406820; US-PATENT-CLASS-356-5; US-PATENT-CLASS-356-4.5) Avail: US Patent and Trademark Office CSCL 20F

An optical instrument, such as a stability monitor or a target range finder, uses an unstabilized laser to project a composite optical signal of coherent light having two naturally occurring longitudinal mode components. A beamsplitter divides the signal into a reference beam which is directed toward one photodetector and a transmitted beam which illuminates and is reflected from a distant target onto a second photodetector optically isolated from the first photodetector. Both photodetectors are operated on the square law principle to provide electrical signals modulated at a frequency equal to the separation between the frequencies of the two longitudinal mode components of the optical signal projected by the laser. Slight movement of the target may be detected and measured by electrically monitoring the phase difference between the two signals provided by the photodetectors and the range of the target measured with the aid of a microprocessor by changing the separation between the longitudinal modes by shifting the length of the resonator cavity in an iterative series of increments.

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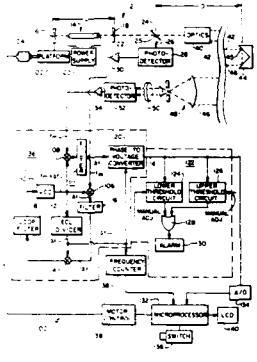
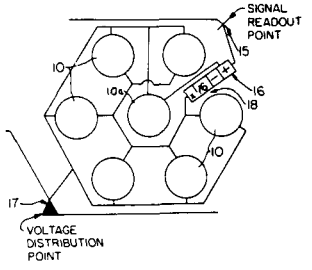


N86-33137*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PHOTODETECTOR ARRAY WITH IMAGE PLANE PROCESSING Patent Application

D. J. JOBSON, inventor (to NASA) 16 Jul. 1986 11 p (NASA-CASE-LAR-13391-1; US-PATENT-APPL-SN-886133; NAS 1.71:LAR-13391-1) Avail: NTIS HC A02/MF A01 CSCL 20F

An apparatus is provided for merging image detection provided by an array of photodetector elements and local neighborhood processing of the outputs of photodetector elements which is useful in applications requiring high speed extraction of meaningful information from raw detector signals. The apparatus combines relatively large photodetector elements with small electronic processing elements located between the photodetector elements on the same chip. The close proximity of the photodetector and signal processing elements increases the speed of information acquisition and minimizes undesirable signal noise. NASA



N86-33138*# National Aeronautics and Space Administration. Pasadena Office, Calif.

COMPENSATION FOR PRIMARY REFLECTOR WAVEFRONT ERROR Patent Application

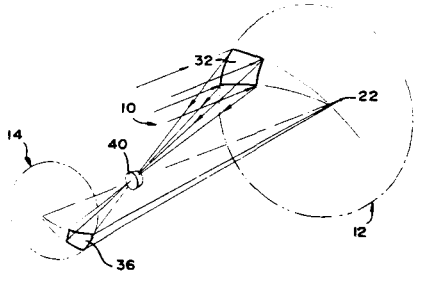
A. B. MEINEL, inventor (to NASA), M. P. MEINEL, inventor (to NASA), and J. E. STACY, inventor (to NASA) 29 May 1986 16 p

(Contract NAS7-918)

(NASA-CASE-NPO-16869-1CU; US-PATENT-APPL-SN-867986; NAS 1.71:NPO-16869) Avail: NTIS HC A02/MF A01 CSCL 20F

The object of the invention is to compensate for errors in a large telescope primary reflector by making certain compensating deviations in a smaller, auxiliary reflector of the telescope. At least one intermediate element forms an image of the primary surface onto the secondary surface, so each point on the secondary surface corresponds to a point on the primary surface. The secondary surface is formed with a deviation from an ideal secondary surface, with the piston distance of each point on the actual secondary surface equal to the piston distance of a corresponding piston on the actual primary surface from the ideal primary surface. It is found that this results in electromagnetic (e.g., light) rays which strike a deviating area of the actual primary surface being brought to the same focus as if the actual primary surface did not have a diviation from an ideal primary surface.

NASA



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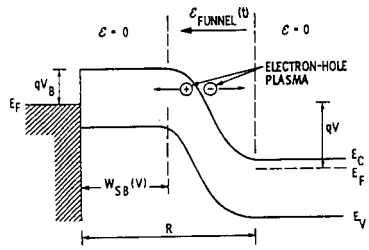
SOLID-STATE PHYSICS

Includes superconductivity.

N86-25269*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD OF MEASURING FIELD FUNNELING AND RANGE STRAGGLING IN SEMICONDUCTOR CHARGE-COLLECTING JUNCTIONS Patent Application
J. A. ZOUTENDYK, inventor (to NASA) 27 Nov. 1985 19 p
(Contract NAS7-918)
(NASA-CASE-NPO-16584-1-CU; NAS 1.71:NPO-16584-1-CU; US-PATENT-APPL-SN-802769) Avail: NTIS HC A02/MF A01 CSCL 20L

Electric-field funneling length is measured while irradiating a semiconductor charge-collecting junction with electron-hole-pair generating charged particles at a first junction bias voltage. The bias voltage is then reduced to a second level in order to reduce the depth of the depletion region such that the total charge can no longer be collected by drift and measured in the energy band previously displayed in the multichannel analyzer. This is representative of the maximum electric field funneling length which may be calculated by measuring the difference at the second bias voltage level of the depletion width and the ion penetration range. The bias voltage is further lowered to a third level at which the particles are collected over a spread of energy levels while at least some of the particles are still collected at the selected energy level. From this the different depths of penetration of the particles are determined while additional effects due to diffusion are minimized. NASA



N86-28760* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD OF MAKING MACROCRYSTALLINE OR SINGLE CRYSTAL SEMICONDUCTOR MATERIAL Patent
P. J. SHLICHTA, inventor (to NASA) and R. J. HOLLIDAY, inventor (to NASA) 24 Jun. 1986 4 p Filed 10 Feb. 1983 Supersedes N83-21993 (21 - 11, p 1796)
(NASA-CASE-NPO-15904-1; US-PATENT-4,596,626; US-PATENT-APPL-SN-465369; US-PATENT-CLASS-156-610; US-PATENT-CLASS-156-DIG.88; US-PATENT-CLASS-156-624) Avail: US Patent and Trademark Office CSCL 20L

A macrocrystalline or single crystal semiconductive material is formed from a primary substrate including a single crystal or several very large crystals of a relatively low melting material. This primary substrate is deposited on a base such as steel or ceramic, and it may be formed from such metals as zinc, cadmium, germanium, aluminum, tin, lead, copper, brass, magnesium silicide, or magnesium stannide. These materials generally have a melting point below about 1000 C and form on the base crystals the size of fingernails or greater. The primary substrate has an epitaxial relationship with a subsequently applied layer of material, and because of this epitaxial relationship, the material deposited on the primary substrate will have essentially the same crystal size as the crystals in the primary substrate. If required, successive layers are formed, each of a material which has an epitaxial relationship with the previously deposited layer, until a layer is formed which has an epitaxial relationship with the semiconductive material. This layer is referred to as the epitaxial substrate, and its crystals serve as sites for the growth of large crystals of semiconductive material. The primary substrate is passivated to remove or otherwise convert it into a stable or nonreactive state prior to deposition of the seconductive material.
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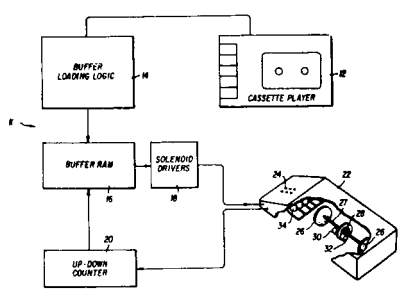
DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

N86-25292*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BRAILLE READING SYSTEM Patent Application
H. D. GARNER, inventor (to NASA) 31 Mar. 1986 11 p
Sponsored by NASA
(NASA-CASE-LAR-13306-1; NAS 1.71:LAR-13306-1; US-PATENT-APPL-SN-846430) Avail: NTIS HC A02/MF A01 CSCL 05B

A Braille reading system wherein the display of characters is controlled by moving a position sensor is developed. A text recorded on a cassette tape is removed by a cassette player under the control of loading logic. The logic controls the cassette player to remove one or two pages of the text at a time. The removed text is stored in buffer memory. One character at a time is retrieved from memory and received by solenoid drivers. These drivers control a series of solenoids and pins to present a standard Braille representation of the character selected. The Braille display is mounted on a mouse which may be manually moved by the operator. When the mouse is moved, an optical pickoff determines the amount of movement of the mouse and forwards signals to an up down counter to record its position. When the mouse is moved a predetermined distance, the character to be displayed is changed to the next character in the text. NASA



PUBLIC AVAILABILITY OF COPIES OF PATENTS AND PATENT APPLICATIONS

Copies of U.S. patents may be purchased directly from the U.S. Patent and Trademark Office, Washington, D.C. 20231 at $1.50 per copy. When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, preferably by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the Patent and Trademark Office.

NASA *patent application specifications* are sold in paper copy by the National Technical Information Service at price code A02. Microfiche are sold at price code A01. The US-Patent-Appl-SN-number should be used in ordering either paper copy or microfiche from NTIS.

LICENSES FOR COMMERCIAL USE: INQUIRIES AND APPLICATIONS FOR LICENSE

NASA inventions, abstracted in *NASA PAB,* are available for nonexclusive or exclusive licensing in accordance with the NASA Patent Licensing Regulations. It is significant that all licenses for NASA inventions shall be by express written instruments and that no license will be granted or implied in a NASA invention except as provided in the NASA Patent Licensing Regulations.

Inquiries concerning the NASA Patent Licensing Program or the availability of licenses for the commercial use of NASA-owned inventions covered by U.S. patents or pending applications for patent should be forwarded to the NASA Patent Counsel of the NASA installation having cognizance of the specific invention, or the Associate General Counsel for Intellectual Property, Code GP, National Aeronautics and Space Administration, Washington, D.C. 20546. Inquiries should refer to the NASA Case Number, the Title of the Invention, and the U.S. Patent Number or the U.S. Application Serial Number assigned to the invention as shown in *NASA PAB.*

The NASA Patent Counsel having cognizance of the invention is determined by the first three letters or prefix of the NASA Case Number assigned to the invention. The addresses of NASA Patent Counsels are listed alongside the NASA Case Number prefix letters in the following table.

STANDING ORDER SUBSCRIPTIONS

NASA SP-7039, Section 1 and its supplements are available from the National Technical Information Service (NTIS) on standing order subscription as PB 86-911100 at the price of $11.50 domestic and $23.00 foreign. Standing order subscriptions do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.

NASA Case Number Prefix Letters	Address of Cognizant NASA Patent Counsel
ARC-xxxxx XAR-xxxxx	Ames Research Center Mail Code: 200-11A Moffett Field, California 94035 Telephone: (415) 694-5104
ERC-xxxxx XER-xxxxx HQN-xxxxx XHQ-xxxxx	NASA Headquarters Mail Code: GP Washington, D.C. 20546 Telephone: (202) 453-2417
GSC-xxxxx XGS-xxxxx	Goddard Space Flight Center Mail Code: 204 Greenbelt, Maryland 20771 Telephone: (301) 286-7351
KSC-xxxxx XKS-xxxxx	John F. Kennedy Space Center Mail Code: PT-PAT Kennedy Space Center, Florida 32899 Telephone: (305) 867-2544
LAR-xxxxx XLA-xxxxx	Langley Research Center Mail Code: 279 Hampton, Virginia 23365 Telephone: (804) 865-3725
LEW-xxxxx XLE-xxxxx	Lewis Research Center Mail Code: 500-318 21000 Brookpark Road Cleveland, Ohio 44135 Telephone: (216) 433-5753
MSC-xxxxx XMS-xxxxx	Lyndon B. Johnson Space Center Mail Code: AL3 Houston, Texas 77058 Telephone: (713) 483-4871
MFS-xxxxx XMF-xxxxx	George C. Marshall Space Flight Center Mail Code: CC01 Huntsville, Alabama 35812 Telephone: (205) 544-0024
NPO-xxxxx XNP-xxxxx FRC-xxxxx XFR-xxxxx WOO-xxxxx	NASA Resident Legal Office Mail Code: 180-801 4800 Oak Grove Drive Pasadena, California 91103 Telephone: (818)354-2700

PATENT LICENSING REGULATIONS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

14 CFR Part 1245

Licensing of NASA Inventions

AGENCY: National Aeronautics and Space Administration.

ACTION: Interim regulation with comments requested.

SUMMARY: The National Aeronautics and Space Administration (NASA) is revising its patent licensing regulations to conform with Pub. L. 96-517. This interim regulation provides policies and procedures applicable to the licensing of federally owned inventions in the custody of the National Aeronautics and Space Administration, and implements Pub. L. 96-517. The object of this subpart is to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

EFFECTIVE DATE: July 1, 1981. Comments must be received in writing by December 2, 1981. Unless a notice is published in the **Federal Register** after the comment period indicating changes to be made, this interim regulation shall become a final regulation.

ADDRESS: Mr. John G. Mannix, Director of Patent Licensing, GP-4, NASA, Washington, D.C. 20546.

FOR FURTHER INFORMATION CONTACT:
Mr. John G. Mannix, (202) 755-3954.

SUPPLEMENTARY INFORMATION:

PART 1245—PATENTS AND OTHER INTELLECTUAL PROPERTY RIGHTS

Subpart 2 of Part 1245 is revised to read as follows:

* * * * *

Subpart 2—Licensing of NASA Inventions

Sec.

Authority: 35 U.S.C. Section 207 and 208, 94 Stat. 3023 and 3024.

* * * * *

Subpart 2—Licensing of NASA Inventions

§ 1245.200 Scope of subpart.

This subpart prescribes the terms, conditions, and procedures upon which a NASA invention may be licensed. It does not affect licenses which (a) were in effect prior to July 1, 1981; (b) may exist at the time of the Government's acquisition of title to the invention, including those resulting from the allocation of rights to inventions made under Government research and development contracts; (c) are the result of an authorized exchange of rights in the settlement of patent disputes; or (d) are otherwise authorized by law or treaty.

§ 1245.201 Policy and objective.

It is the policy and objective of this subpart to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

§ 1245.202 Definitions.

(a) "Federally owned invention" means an invention, plant, or design which is covered by a patent, or patent application in the United States, or a patent, patent application, plant variety protection, or other form of protection, in a foreign country, title to which has been assigned to or otherwise vested in the United States Government.

(b) "Federal agency" means an executive department, military department, Government corporation, or independent establishment, except the Tennessee Valley Authority, which has custody of a Federally owned invention.

(c) "NASA Invention" means a Federally owned invention with respect to which NASA maintains custody and administration, in whole or in part, of the right, title, or interest in such invention on behalf of the United States Government.

(d) "Small business firm" means a small business concern as defined at section 2 of Pub. L. 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of these regulations, the size standard for small business concerns involved in Government procurement, contained in 13 C.F.R. 121.3-8, and in subcontracting, contained in 13 CFR 121.3-12, will be used.

(e) "Practical application" means to manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are to the extent permitted by law or Government regulations available to the public on reasonable terms.

(f) "United States" means the United States of America, its territories and possessions, the District of Columbia, and the Commonwealth of Puerto Rico.

§ 1245.203 Authority to grant licenses.

NASA inventions shall be made available for licensing as deemed appropriate in the public interest. NASA may grant nonexclusive, partially exclusive, or exclusive licenses thereto under this subpart on inventions in its custody.

Restrictions and Conditions

§ 1245.204 All licenses granted under this subpart.

(a) *Restrictions.* (1) A license may be granted only if the applicant has supplied NASA with a satisfactory plan for development or marketing of the invention, or both, and with information about the applicant's capability to fulfill the plan.

(2) A license granting rights to use or sell under a NASA invention in the United States shall normally be granted only to a licensee who agrees that any products embodying the invention or produced through the use of the invention will be manufactured substantially in the United States.

(b) *Conditions.* Licenses shall contain such terms and conditions as NASA determines are appropriate for the protection of the interests of the Federal Government and the public and are not in conflict with law or this subpart. The following terms and conditions apply to any license:

(1) The duration of the license shall be for a period specified in the license agreement, unless sooner terminated in accordance with this subpart.

(2) The license may be granted for all or less than all fields of use of the invention or in specified geographical areas, or both.

(3) The license may extend to subsidiaries of the licensee or other parties if provided for in the license but shall be nonassignable without approval of NASA, except to the successor of that part of the licensee's business to which the invention pertains.

(4) The license may provide the licensee the right to grant sublicenses under the license, subject to the approval of NASA. Each sublicense shall make reference to the license, including the rights retained by the Government, and a copy of such sublicense shall be furnished to NASA.

(5) The license shall require the licensee to carry out the plan for development or marketing of the invention, or both, to bring the invention to practical application within a period specified in the license, and to continue to make the benefits of the invention reasonably accessible to the public.

(6) The license shall require the licensee to report periodically on the utilization or efforts at obtaining utilization that are being made by the licensee, with particular reference to the plan submitted.

(7) All licenses shall normally require royalties or other consideration.

(8) Where an agreement is obtained pursuant to § 1245.204(a)(2) that any products embodying the invention or produced through use of the invention will be manufactured substantially in the United States, the license shall recite such agreement.

(9) The license shall provide for the right of NASA to terminate the license, in whole or in part, if:

(i) NASA determines that the licensee is not executing the plan submitted with its request for a license and the licensee cannot otherwise demonstrate to the satisfaction of NASA that it has taken or can be expected to take within a reasonable time effective steps to achieve practical application of the invention;

(ii) NASA determines that such action is necessary to meet requirements for public use specified by Federal regulations issued after the date of the license and such requirements are not reasonably satisfied by the licensee;

(iii) The licensee has willfully made a false statement of or willfully omitted a material fact in the license application or in any report required by the license agreement; or

(iv) The licensee commits a substantial breach of a covenant or agreement contained in the license.

(10) The license may be modified or terminated, consistent with this subpart, upon mutual agreement of NASA and the licensee.

(11) Nothing relating to the grant of a license, nor the grant itself, shall be construed to confer upon any person any immunity from or defenses under the antitrust laws or from a charge of patent misuse, and the acquisition and use of rights pursuant to this subpart shall not be immunized from the operation of state or Federal law by reason of the source of the grant.

Types of Licenses

§ 1245.205 Nonexclusive licenses.

(a) *Availability of licenses.* Nonexclusive licenses may be granted under NASA inventions without publication of availability or notice of a prospective license.

(b) *Conditions.* In addition to the provisions of § 1245.204, the nonexclusive license may also provide that, after termination of a period specified in the license agreement, NASA may restrict the license to the fields of use or geographic areas, or both, in which the licensee has brought the invention to practical application and continues to make the benefits of the invention reasonably accessible to the public. However, such restriction shall be made only in order to grant an exclusive or partially exclusive license in accordance with this subpart.

§ 1245.206 Exclusive and partially exclusive licenses.

(a) Domestic licenses.

(1) *Availability of licenses.* Exclusive or partially exclusive licenses may be granted on NASA inventions: (i) 3 months after notice of the invention's availability has been announced in the **Federal Register**; or (ii) without such notice where NASA determines that expeditious granting of such a license will best serve the interests of the Federal Government and the public; and (iii) in either situation, specified in (a)(1)(i) or (ii) of this section only if:

(A) Notice of a prospective license, identifying the invention and the prospective licensee, has been published in the **Federal Register**, providing opportunity for filing written objections within a 60-day period;

(B) After expiration of the period in § 1245.206(a) (1)(iii)(A) and consideration of nay written objections received during the period, NASA has determined that:

(*1*) The interests of the Federal Government and the public will best be served by the proposed license, in view of the applicant's intentions, plans, and ability to bring the invention to practical application or otherwise promote the invention's utilization by the public;

(*2*) The desired practial application has not been achieved, or is not likely expeditiously to be achieved, under any nonexclusive license which has been granted, or which may be granted, on the invention;

(*3*) Exclusive or partially exclusive licensing is a reasonable and necessary incentive to call forth the investment of risk capital and expenditures to bring the invention to practical application or otherwise promote the invention's utilization by the public; and

(*4*) The proposed terms and scope of exclusivity are not greater than reasonably necessary to provide the incentive for bringing the invention to practical application or otherwise promote the invention's utilization by the public;

(C) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the country in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with the antitrust laws; and

(D) NASA has given first preference to any small business firms submitting plans that are determined by the agency to be within the capabilities of the firms and as equally likely, if executed, to bring the invention to practical application as any plans submitted by applicants that are not small business firms.

(2) *Conditions.* In addition to the provisions of § 1245.204, the following terms and conditions apply to domestic exclusive and partially exclusive licenses:

(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(ii) The license shall reserve to NASA the right to require the licensee to grant sublicenses to responsible applicants, on reasonable terms, when necessary to fulfill health or safety needs.

(iii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.

(iv) The license may grant the licensee the right of enforcement of the licensed patent pursuant to the provisions of Chapter 29 of Title 35, United States Code, or other statutes, as determined appropriate in the public interest.

(b) Foreign licenses.

(1) *Availability of licenses.* Exclusive or partially exclusive licenses may be granted on a NASA invention covered by a foreign patent, patent application, or other form of protection, provided that:

(i) Notice of a prospective license,

identifying the invention and prospective licensee, has been published in the Federal Register, providing opportunity for filing written objections within a 60-day period and following consideration of such objections;

(ii) NASA has considered whether the interests of the Federal Government or United States industry in foreign commerce will be enhanced; and

(iii) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the United States in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with antitrust laws.

(2) *Conditions.* In addition to the provisions of § 1245.204, the following terms and conditions apply to foreign exclusive and partially exclusive licenses:

(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(ii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.

(iii) The license may grant the licensee the right to take any suitable and necessary actions to protect the licensed property, on behalf of the Federal Government.

(c) *Record of determinations.* NASA shall maintain a record of determinations to grant exclusive or partially exclusive licenses.

Procedures

§ 1245.207 Application for a license.

An application for a license should be addressed to the Patent Counsel at the NASA installation having responsibility for the invention and shall normally include:

(a) Identification of the invention for which the license is desired, including the patent application serial number or patent number, title, and date, if known;

(b) Identification of the type of license for which the application is submitted;

(c) Name and address of the person, company, or organization applying for the license and the citizenship or place of incorporation of the applicant;

(J) Name, address, and telephone number of representative of applicant to whom correspondence should be sent;

(e) Nature and type of applicant's business, identifying products or services which the applicant has successfully commercialized, and approximate number of applicant's employees;

(f) Source of information concerning the availability of a license on the invention;

(g) A statement indicating whether applicant is a small business firm as defined in § 1245.202(c);

(h) A detailed description of applicant's plan for development or marketing of the invention, or both, which should include:

(1) A statement of the time, nature and amount of anticipated investment of capital and other resources which applicant believes will be required to bring the invention to practical application;

(2) A statement as to applicant's capability and intention to fulfill the plan, including information regarding manufacturing, marketing, financial, and technical resources;

(3) A statement of the fields of use for which applicant intends to practice the invention; and

(4) A statement of the geographic areas in which applicant intends to manufacture any products embodying the invention and geographic areas where applicant intends to use or sell the invention, or both;

(i) Identification of licenses previously granted to applicant under Federally owned inventions;

(j) A statement containing applicant's best knowledge of the extent to which the invention is being practiced by private industry or Government, or both, or is otherwise available commercially; and

(k) Any other information which applicant believes will support a determination to grant the license to applicant.

§ 1245.208 Processing applications.

(a) Applications for licenses will be initially reviewed by the Patent Counsel of the NASA installation having responsibility for the invention. The Patent Counsel shall make a preliminary recommendation to the Director of Licensing, NASA Headquarters, whether to: (1) grant the license as requested, (2) grant the license with modification after negotiation with the licensee, or (3) deny the license. The Director of Licensing shall review the preliminary recommendation of the Patent Counsel and make a final recommendation to the NASA Assistant General Counsel for Patent Matters. Such review and final recommendation may include, and be based on, any additional information obtained from applicant and other sources that the Patent Counsel and the Director of Licensing deem relevant to the license requested. The determination to grant or deny the license shall be made by the Assistant General Counsel for Patent Matters based on the final recommendation of the Director of Licensing.

(b) When notice of a prospective exclusive or partially exclusive license is published in the Federal Register in accordance with § 1245.206(a)(1)(iii)(A) or § 1245.206(b)(1)(i), any written objections received in response thereto will be considered by the Director of Licensing in making the final recommendation to the Assistant General Counsel for Patent Matters.

(c) If the requested license, including any negotiated modifications, is denied by the Assistant General Counsel for Patent Matters, the applicant may request reconsideration by filing a written request for reconsideration within 30 days after receiving notice of denial. This 30-day period may be extended for good cause.

(d) In addition to, or in lieu of requesting reconsideration, the applicant may also appeal the denial of the license in accordance with § 1245.211.

§ 1245.209 Notice to Attorney General.

A copy of the notice provided for in §§ 1245.206(a)(1)(iii)(A), and 1245.206(b)(1)(i) will be sent to the Attorney General.

§ 1245.210 Modification and termination of licenses.

Before modifying or terminating a license, other than by mutual agreement, NASA shall furnish the licensee and any sublicensee of record a written notice of intention to modify or terminate the license, and the licensee and any sublicensee shall be allowed 30 days after such notice to remedy any breach of the license or show cause why the license should not be modified or terminated.

§ 1245.211 Appeals.

(a) The following parties may appeal to the NASA Administrator or designee any decision or determination concerning the grant, denial, interpretation, modification, or termination of a license:

(1) A person whose application for a license has been denied;

(2) A licensee whose license has been modified or terminated, in whole or in part; or

(3) A person who timely filed a written objection in response to the notice required by §§ 1245.206(a)(1)(iii)(A) or

1245.208(b)(1)(i) and who can demonstrate to the satisfaction of NASA that such person may be damaged by the Agency action.

(b) Written notice of appeal must be filed within 30 days (or such other time as may be authorized for good cause shown) after receiving notice of the adverse decision or determination; including, an adverse decision following the request for reconsideration under § 1245.208(c). The notice of appeal, along with all supporting documentation should be addressed to the Administrator, National Aeronautics and Space Administration, Washington. DC 20546. Should the appeal raise a genuine dispute over material facts, fact-finding will be conducted by the NASA Inventions and Contributions Board. The person filing the appeal shall be afforded an opportunity to be heard and to offer evidence in support of the appeal. The Chairperson of the Inventions and Contributions Board shall prepare written findings of fact and transmit them to the Administrator or designee. The decision on the appeal shall be made by the NASA Administrator or designee. There is no further right of administrative appeal from the decision of the Administrator or designee.

§ 1245.212 Protection and administration of inventions.

NASA may take any suitable and necessary steps to protect and administer rights to NASA inventions, either directly or through contract.

§ 1245.213 Transfer of custody.

NASA having custody of certain Federally owned inventions may transfer custody and administration in whole or in part, to another Federal agency, of the right, title, or interest in any such invention.

§ 1245.214 Confidentiality of information.

Title 35, United States Code, section 209, provides that any plan submitted pursuant to § 1245.207(h) and any report required by § 1245.204(b)(6) may be treated by NASA as commercial and financial information obtained from a person and privileged and confidential and not subject to disclosure under section 552 of Title 5 of the United States Code.

James M. Beggs,

Administrator.

October 15, 1981.

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15. Supplementary Notes

Section 1: Abstracts

16. Abstract

Abstracts are provided for 105 patents and patent applications entered into the NASA scientific and technical information system during the period July 1986 through December 1986. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application.

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